Digital Temperature Controller

E5CC/E5EC

The new standard in temperature control is higher in every respect
E5CC (48 × 48 mm) / E5EC (48 × 96 mm)

Large White PV Display That's Easier to Read.
Easy to Use, from Model Selection to Setup and Operation.
A Complete Range of I/O Capacities, Functions, and Performance.
Handles More Applications.

48 × 48 mm
E5CC

48 × 96 mm
E5EC

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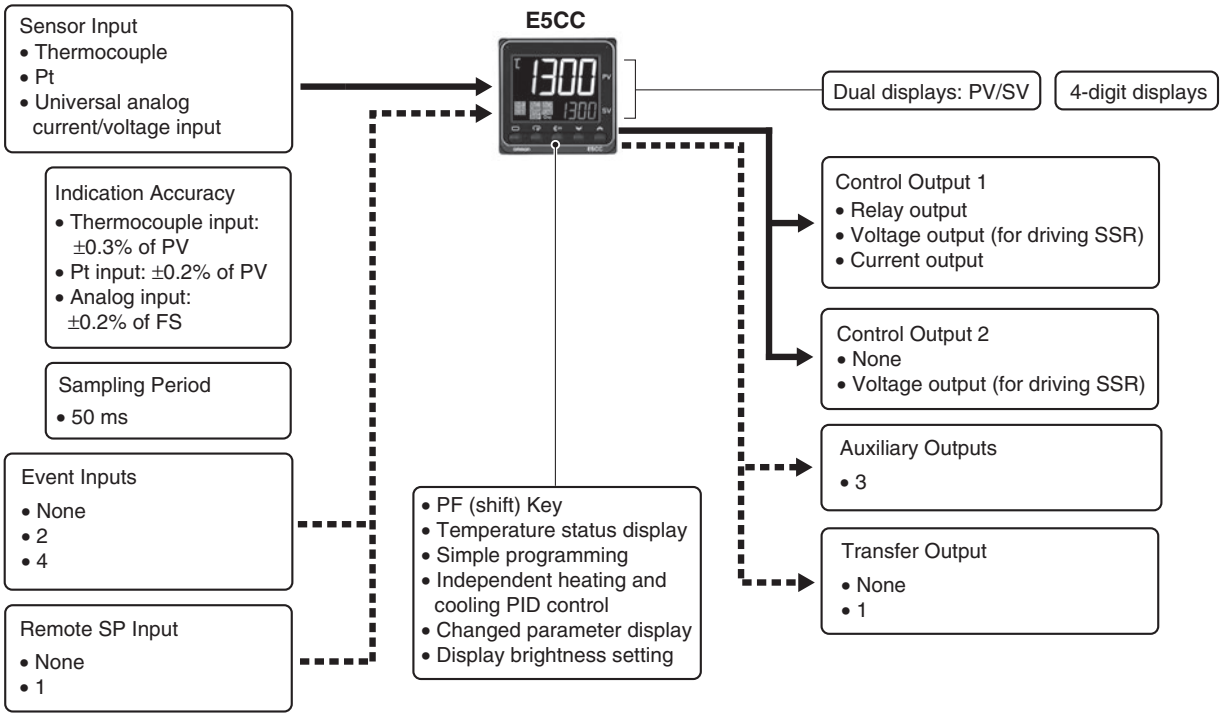
E5CC

⚠ Refer to Safety Precautions on page 30.

- The white PV display with a height of 15.2 mm improves visibility.
- Easy setup with the CX-Thermo (sold separately).
- Only 48 × 48 mm (C size) and provides five keys. As easy to operate as 48 × 96 mm (E size) models.
- High-speed sampling at 50 ms.
- Models with up to 3 auxiliary outputs, 4 event inputs, a transfer output, and remote SP input added to the lineup. Complete selection of I/O capacities.
- Short body with depth of only 60 mm.
- Easily connect the CX-Thermo (sold separately) through a USB-Serial Conversion Cable (sold separately) to a Setup Tool port on the top panel or on the front panel. The Digital Temperature Controller receives the power required for setup from the computer through the USB bus power source.

Main I/O Functions



This datasheet is provided as a guideline for selecting products.
Be sure to refer to the following manuals for application precautions and other information required for operation before attempting to use the product.
E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174)
E5CC/E5EC Digital Controllers Communications Manual (Cat. No. H175)

Model Number Legend and Standard Models

Model Number Legend

E5CC-□□ □ □ □ □ □-□□□ (Example: E5CC-RX3A5M-000)

①②③④⑤⑥

Model	① Control outputs 1 and 2	② No. of auxiliary outputs	③ Power supply voltage	④ Terminal type	⑤ Input type	⑥ Options	Meaning	
E5CC							**48 × 48 mm**	
							Control output 1	**Control output 2**
	RX						Relay output	None
	QX						Voltage output (for driving SSR)	None
***1 *3**	CX						Linear current output *2	None
	QQ						Voltage output (for driving SSR)	Voltage output (for driving SSR)
		3					3 (one common)	
			A				100 to 240 VAC	
			D				24 VAC/DC	
				5			Screw terminals (with cover)	
					M		Universal input	

		HB alarm and HS alarm	Communications	Event inputs	Remote SP Input	Transfer output
	000	---	---	---	---	---
***1**	001	1	---	2	---	---
***1**	003	2 (for 3-phase heaters)	RS-485	---	---	---
***3**	004	---	RS-485	2	---	---
	005	---	---	4	---	---
	006	---	---	2		Provided.
	007	---	---	2	Provided.	---

*1. Options with HB and HS alarms (001 and 003) cannot be selected if a current output is selected for the control output.
*2. The control output cannot be used as a transfer output.
*3. Option 004 can be selected only when "CX" is selected for the control outputs.

Heating and Cooling Control

● Using Heating and Cooling Control

① Control Output Assignment
If there is no control output 2, an auxiliary output is used as the cooling control output.
If there is a control output 2, the two control outputs are used for heating and cooling.
(It does not matter which output is used for heating and which output is used for cooling.)
② Control
If PID control is used, you can set PID control separately for heating and cooling.
This allows you to handle control systems with different heating and cooling response characteristics.

Optional Products (Order Separately)

USB-Serial Conversion Cable

Model
E58-CIFQ2

Terminal Covers

Model
E53-COV17
E53-COV23

Note: The E53-COV10 cannot be used.
Refer to page 11 for the mounted dimensions.

Waterproof Packing

Model
Y92S-P8

Note: This Waterproof Packing is provided with the Digital Temperature Controller.

Current Transformers (CTs)

Hole diameter	Model
5.8 mm	**E54-CT1**
12.0 mm	**E54-CT3**

Adapter

Model
Y92F-45

Note: Use this Adapter when the panel has already been prepared for an E5B□ Controller.

Waterproof Cover

Model
Y92A-48N

Note: This Cover complies with IP66 and NEMA 4X waterproofing.
Front panel: IP66 protection.

Mounting Adapter

Model
Y92F-49

Note: This Mounting Adapter is provided with the Digital Temperature Controller.

Front Covers

Type	Model
Hard Front Cover	**Y92A-48H**
Soft Front Cover	**Y92A-48D**

CX-Thermo Support Software

Model
EST2-2C-MV4

Note: CX-Thermo version 4.4 or higher is required for the E5CC.

Specifications

Ratings

Power supply voltage		A in model number: 100 to 240 VAC, 50/60 Hz D in model number: 24 VAC, 50/60 Hz; 24 VDC
Operating voltage range		85% to 110% of rated supply voltage
Power consumption		Models with option selection of 000: 5.2 VA max. at 100 to 240 VAC, and 3.1 VA max. at 24 VDC or 1.6 W max. at 24 VDC All other models: 6.5 VA max. at 100 to 240 VAC, and 4.1 VA max. at 24 VDC or 2.3 W max. at 24 VDC
Sensor input		Models with temperature inputs Thermocouple: K, J, T, E, L, U, N, R, S, B, W, or PL II Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor: 10 to 70°C, 60 to 120°C, 115 to 165°C, or 140 to 260°C Analog input Current input: 4 to 20 mA or 0 to 20 mA Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V
Input impedance		Current input: 150 Ω max., Voltage input: 1 MΩ min. (Use a 1:1 connection when connecting the ES2-HB/THB.)
Control method		ON/OFF control or 2-PID control (with auto-tuning)
Control output	**Relay output**	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA *
	Voltage output (for driving SSR)	Output voltage: 12 VDC ±20% (PNP), max. load current: 21 mA, with short-circuit protection circuit
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000
Auxiliary output	**Number of outputs**	3
	Output specifications	N.O. relay outputs, 250 VAC, Models with 3 outputs: 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V
Event input	**Number of inputs**	2 or 4 (depends on model)
	External contact input specifications	Contact input: ON: 1 kΩ max., OFF: 100 kΩ min.
		Non-contact input: ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.
		Current flow: Approx. 7 mA per contact
Transfer output	**Number of outputs**	1 (only on models with a transfer output)
	Output specifications	Contact output: 4 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000 Linear voltage output: 1 to 5 VDC, load: 1 kΩ max, resolution: Approx. 10,000
Setting method		Digital setting using front panel keys
Remote SP input		Current input: 4 to 20 mA DC or 0 to 20 mA DC (input impedance: 150 Ω max.) Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V (input impedance: 1 MΩ min.)
Indication method		11-segment digital display and individual indicators Character height: PV: 15.2 mm, SV: 7.1 mm
Multi SP		Up to eight set points (SP0 to SP7) can be saved and selected using event inputs, key operations, or serial communications.
Other functions		Manual output, heating/cooling control, loop burnout alarm, SP ramp, other alarm functions, heater burnout (HB) alarm (including SSR failure (HS) alarm), 40% AT, 100% AT, MV limiter, input digital filter, self tuning, robust tuning, PV input shift, run/stop, protection functions, extraction of square root, MV change rate limit, simple calculations, temperature status display, simple programming, moving average of input value, and display brightness setting
Ambient operating temperature		-10 to 55°C (with no condensation or icing), for 3-year warranty: -10 to 50°C (with no condensation or icing)
Ambient operating humidity		25% to 85%
Storage temperature		-25 to 65°C (with no condensation or icing)

* You cannot select a relay output or current output for control output 2.

Input Ranges

●Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Input type	Platinum resistance thermometer					Thermocouple															Infrared temperature sensor			
Name	Pt100			JPt100		K		J		T		E	L	U		N	R	S	B	W	PLII	10 to 70°C	60 to 120°C	115 to 165°C	140 to 260°C
Temperature range (°C)	850	500.0	100.0	500.0	100.0	1300	500.0	850	400.0	400	400.0	600	850	400	400.0	1300	1700	1700	1800	2300	1300	90	120	165	260
	0.0			0.0		-20.0	-100	-20.0					-100				0	0	100	0	0	0	0	0	0
	-200	-199.9		199.9		-200				-200	-199.9	-200		-200	-199.9	-200									
Setting number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Shaded settings are the default settings.

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: JIS C 1602-1995, IEC 60584-1

L: Fe-CuNi, DIN 43710-1985

U: Cu-CuNi, DIN 43710-1985

W: W5Re/W26Re, ASTM E988-1990

JPt100: JIS C 1604-1989, JIS C 1606-1989

Pt100: JIS C 1604-1997, IEC 60751

PL II: According to Platinel II electromotive force charts from BASF (previously Engelhard)

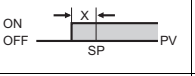
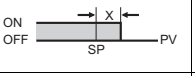
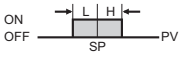
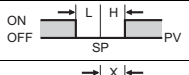
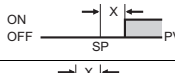
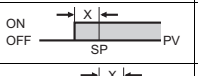
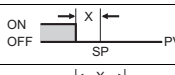
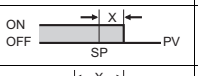
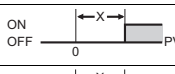
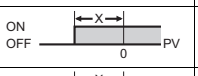
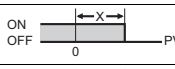
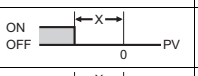
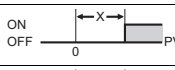
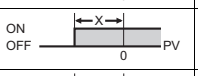
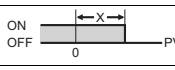
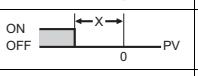
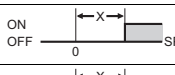
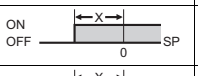
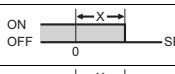
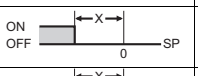
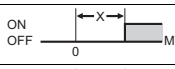
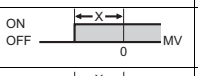
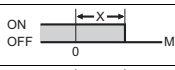
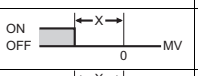
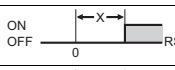
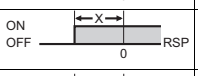
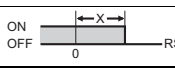
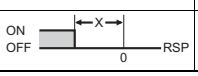
●Analog input

Input type	Current		Voltage		
Input specification	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Setting range	Usable in the following ranges by scaling: -1999 to 9999, -199.9 to 999.9, -19.99 to 99.99 or -1.999 to 9.999				
Setting number	25	26	27	28	29

Alarm Outputs

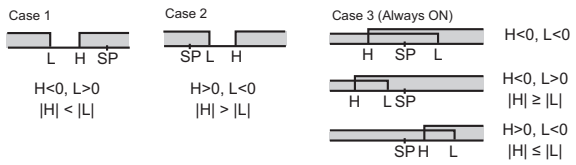
Each alarm can be independently set to one of the following 19 alarm types. The default is 2: Upper limit. (see note.)
Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

Note: In the default settings for models with HB or HS alarms, alarm 1 is set to a heater alarm (HA) and the Alarm Type 1 parameter is not displayed. To use alarm 1, set the output assignment to alarm 1.

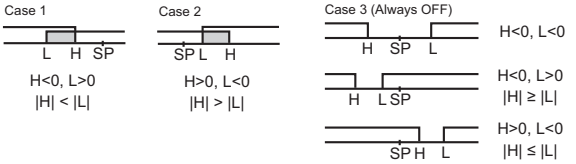
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1		*2	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2	Upper-limit			Set the upward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is higher than the SP by the deviation or more.
3	Lower-limit			Set the downward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is lower than the SP by the deviation or more.
4	Upper- and lower-limit range *1		*3	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is inside this deviation range.
5	Upper- and lower-limit with standby sequence *1	*5 	*4	A standby sequence is added to the upper- and lower-limit alarm (1). *6
6	Upper-limit with standby sequence			A standby sequence is added to the upper-limit alarm (2). *6
7	Lower-limit with standby sequence			A standby sequence is added to the lower-limit alarm (3). *6
8	Absolute-value upper-limit			The alarm will turn ON if the process value is larger than the alarm value (X) regardless of the set point.
9	Absolute-value lower-limit			The alarm will turn ON if the process value is smaller than the alarm value (X) regardless of the set point.
10	Absolute-value upper-limit with standby sequence			A standby sequence is added to the absolute-value upper-limit alarm (8). *6
11	Absolute-value lower-limit with standby sequence			A standby sequence is added to the absolute-value lower-limit alarm (9). *6
12	LBA (alarm 1 type only)	-		*7
13	PV change rate alarm	-		*8
14	SP absolute value upper limit			This alarm type turns ON the alarm when the set point (SP) is higher than the alarm value (X).
15	SP absolute value lower limit			This alarm type turns ON the alarm when the set point (SP) is smaller than the alarm value (X).
16	MV absolute value upper limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is higher than the alarm value (X).
17	MV absolute value lower limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is smaller than the alarm value (X).
18	RSP absolute value upper limit *10			The alarm will turn ON when the remote SP (RSP) is larger than the alarm value (X).
19	RSP absolute value lower limit *10			The alarm will turn ON when the remote SP (RSP) is smaller than the alarm value (X).

*1 With set values 1, 4 and 5, the upper and lower limit values can be set ndependently for each alarm type, and are expressed as “L” and “H.”

*2 Set value: 1, Upper- and lower-limit alarm



*3 Set value: 4, Upper- and lower-limit range



*4 Set value: 5, Upper- and lower-limit with standby sequence
For Upper- and Lower-Limit Alarm Described Above *2

- Case 1 and 2
  Always OFF when the upper-limit and lower-limit hysteresis overlaps.
- Case 3: Always OFF

*5. Set value: 5, Upper- and lower-limit with standby sequence
Always OFF when the upper-limit and lower-limit hysteresis overlaps.

*6 Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174) for information on the operation of the standby sequence.

*7 Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No.H174) for information on the loop burnout alarm (LBA).

*8 Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174) for information on the PV change rate alarm.

*9 When heating/cooling control is performed, the MV absolute upper limit alarm functions only for the heating operation and the MV absolute lower limit alarm functions only for the cooling operation.

*10 This value is displayed only when a remote SP input is used. It functions in both Local SP Mode and Remote SP Mode.

Characteristics

Indication accuracy (at the ambient temperature of 23°C)		Thermocouple: (±0.3% of indicated value or ±1°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indicated value or ±0.8°C, whichever is greater) ±1 digit Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max.
Transfer output accuracy		±0.3% FS max.
Remote SP Input Type		±0.2% FS ±1 digit max.
Influence of temperature *2		Thermocouple input (R, S, B, W, PL II): (±1% of PV or ±10°C, whichever is greater) ±1 digit max. Other thermocouple input: (±1% of PV or ±4°C, whichever is greater) ±1 digit max. *3 Platinum resistance thermometer: (±1% of PV or ±2°C, whichever is greater) ±1 digit max.
Influence of voltage *2		Analog input: (±1%FS) ±1 digit max. CT input: (±5% FS) ±1 digit max. Remote SP input: (±1% FS) ±1 digit max.
Input sampling period		50 ms
Hysteresis		Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) *4 Analog input: 0.01% to 99.99% FS (in units of 0.01% FS)
Proportional band (P)		Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) *4 Analog input: 0.1% to 999.9% FS (in units of 0.1% FS)
Integral time (I)		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Derivative time (D)		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Proportional band (P) for cooling		Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) *4 Analog input: 0.1% to 999.9% FS (in units of 0.1% FS)
Integral time (I) for cooling		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Derivative time (D) for cooling		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Control period		0.1, 0.2, 0.5, 1 to 99 s (in units of 1 s)
Manual reset value		0.0 to 100.0% (in units of 0.1%)
Alarm setting range		-1999 to 9999 (decimal point position depends on input type)
Affect of signal source resistance		Thermocouple: 0.1°C/Ω max. (100 Ωmax.) Platinum resistance thermometer: 0.1°C/Ω max. (10 Ω max.)
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		2,300 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
Vibration	**resistance**	10 to 55 Hz, 20 m/s² for 10 min each in X, Y, and Z directions
	Malfunction	10 to 55 Hz, 20 m/s² for 2 hrs each in X, Y, and Z directions
Destruction	**Shock resistance**	100 m/s², 3 times each in X, Y, and Z directions
	Malfunction	300 m/s², 3 times each in X, Y, and Z directions
Weight		Controller: Approx. 120 g, Mounting Bracket: Approx. 10 g
Degree of protection		Front panel: IP66, Rear case: IP20, Terminals: IP00
Memory protection		Non-volatile memory (number of writes: 1,000,000 times)
Setup Tool		CX-Thermo version 4.4 or higher
Setup Tool port		E5CC top panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect a USB port on the computer with the port on the top panel of the E5CC. *6
Standards	**Approved standards**	UL 61010-1, CSA C22.2 No. 611010-1 (evaluated by UL)
	Conformed standards	EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II
EMC		EMI: EN61326 Radiated Interference Electromagnetic Field Strength: EN 55011 Group 1, class A Noise Terminal Voltage: EN 55011 Group 1, class A EMS: EN 61326 ESD Immunity: EN 61000-4-2 Electromagnetic Field Immunity: EN 61000-4-3 Burst Noise Immunity: EN 61000-4-4 Conducted Disturbance Immunity: EN 61000-4-6 Surge Immunity: EN 61000-4-5 Voltage Dip/Interrupting Immunity: EN 61000-4-11

*1 The indication accuracy of K thermocouples in the -200 to 1300°C range, T and N thermocouples at a temperature of -100°C max., and U and L thermocouples at any temperatures is ±2°C ±1 digit max. The indication accuracy of the B thermocouple at a temperature of 400°Cmax. is not specified. The indication accuracy of B thermocouples in the 400 to 800°Crange is ±3°C max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max. The indication accuracy of W thermocouples is ±0.3 of PV or ±3°C, whichever is greater, ±1 digit max. The indication accuracy of PL II thermocouples is ±0.3 of PV or ±2°C, whichever is greater, ±1 digit max.
*2 Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to 10% of rated voltage
*3 K thermocouple at -100°C max.: ±10°C max.
*4 "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is °C or °F.
*5 The unit is determined by the setting of the Integral/Derivative Time Unit parameter.
*6 External communications (RS-485) and USB-serial conversion cable communications can be used at the same time.

USB-Serial Conversion Cable

Applicable OS	Windows 2000, XP, Vista, or 7
Applicable software	CX-Thermo version 4.4 or higher
Applicable models	E5CC/E5EC and E5CB
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Digital Temperature Controller: Setup Tool port
Power supply	Bus power (Supplied from USB host controller.)*
Power supply voltage	5 VDC
Current consumption	450 mA max.
Output voltage	4.7±0.2 VDC (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Output current	250 mA max. (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Ambient operating temperature	0 to 55°C (with no condensation or icing)
Ambient operating humidity	10% to 80%
Storage temperature	-20 to 60°C (with no condensation or icing)
Storage humidity	10% to 80%
Altitude	2,000 m max.
Weight	Approx. 120 g

* Use a high-power port for the USB port.

Note: A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

Communications Specifications

Transmission line connection method	RS-485: Multipoint
Communications	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Protocol	CompoWay/F, or Modbus
Baud rate	19200, 38400, or 57600 bps
Transmission code	ASCII
Data bit length*	7 or 8 bits
Stop bit length*	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Block check character (BCC) with CompoWay/F or CRC-16 Modbus
Flow control	None
Interface	RS-485
Retry function	None
Communications buffer	217 bytes
Communications response wait time	0 to 99 ms Default: 20 ms

* The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

Current Transformer (Order Separately) Ratings

Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s^2
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

Heater Burnout Alarms and SSR Failure Alarms

CT input (for heater current detection)	Models with detection for singlephase heaters: One input Models with detection for singlephase or three-phase heaters: Two inputs
Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range *1	0.1 to 49.9 A (in units of 0.1 A) Minimum detection ON time: 100 ms *3
SSR failure alarm setting range *2	0.1 to 49.9 A (in units of 0.1 A) Minimum detection OFF time: 100 ms *4

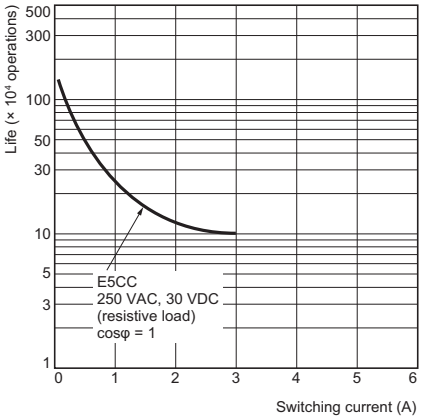
*1 For heater burnout alarms, the heater current will be measured when the control output is ON, and the output will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).

*2 For SSR failure alarms, the heater current will be measured when the control output is OFF, and the output will turn ON if the heater current is higher than the set value (i.e., SSR failure detection current value).

*3 The value is 30 ms for a control period of 0.1 s or 0.2 s.

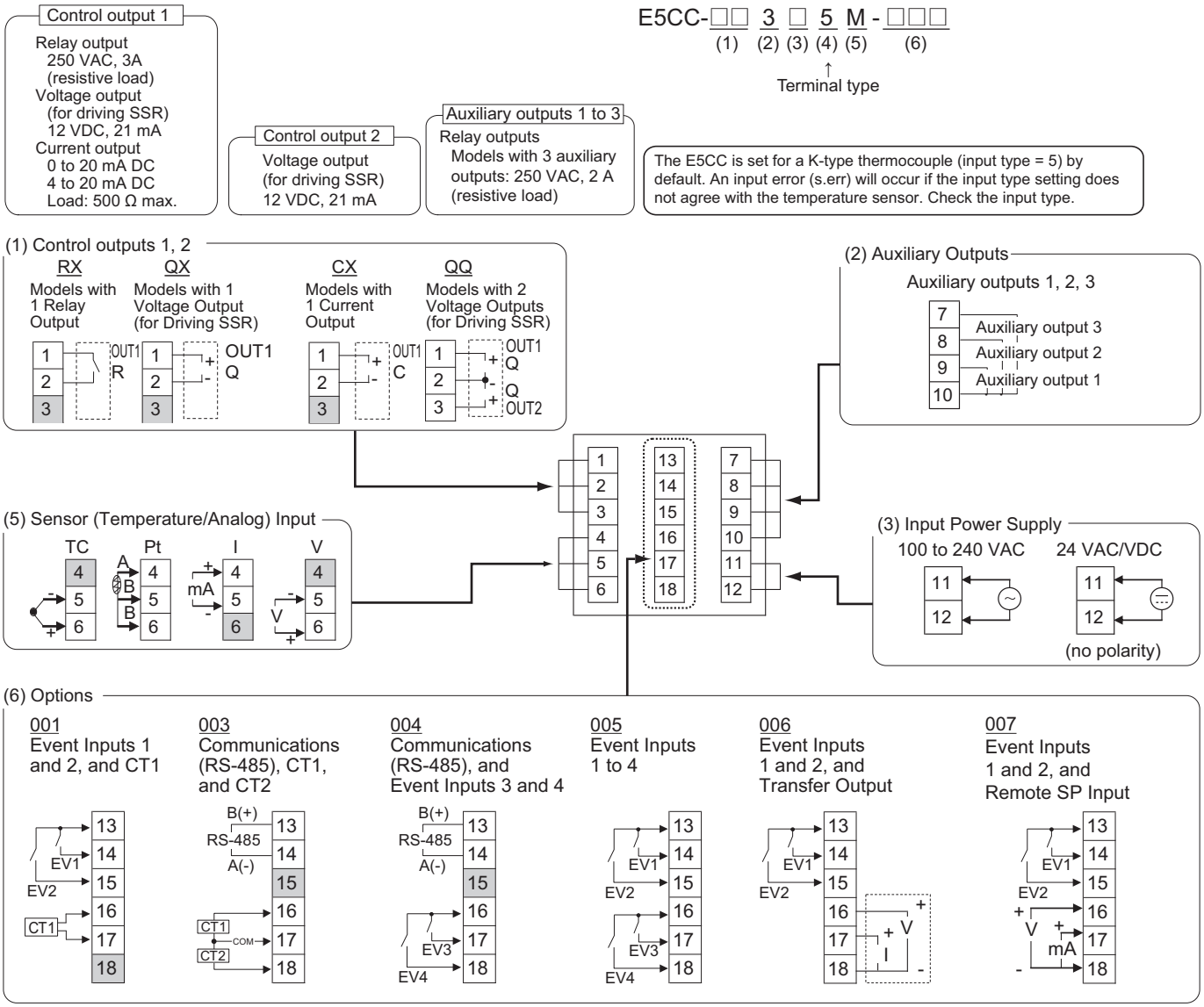
*4 The value is 35 ms for a control period of 0.1 s or 0.2 s.

Electrical Life Expectancy Curve for Relays (Reference Values)



External Connections

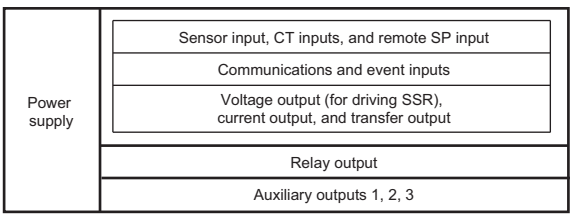
E5CC



Note: 1. The application of the terminals depends on the model.
2. Do not wire the terminals that are shown with a gray background.
3. When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
4. Connect M3 crimped terminals.

Isolation/Insulation Block Diagrams

Models with 3 Auxiliary Outputs


Power supply
Sensor input, CT inputs, and remote SP input
Communications and event inputs
Voltage output (for driving SSR), current output, and transfer output
Relay output
Auxiliary outputs 1, 2, 3

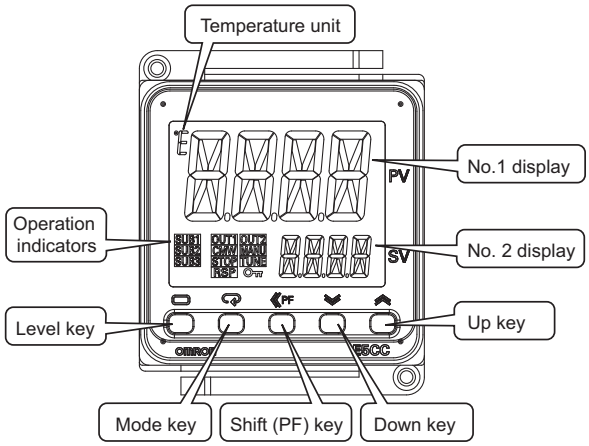
: Reinforced insulation

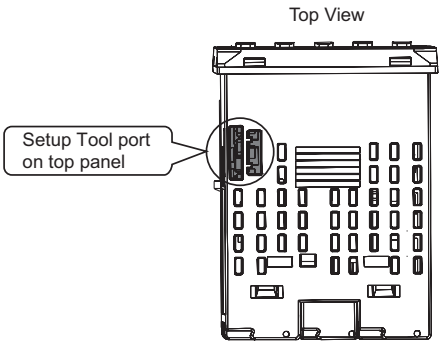
: Functional isolation

Note: Auxiliary outputs 1 to 3 are not isolated.

Nomenclature

E5CC



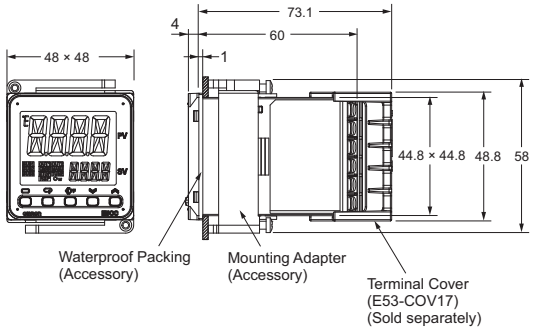


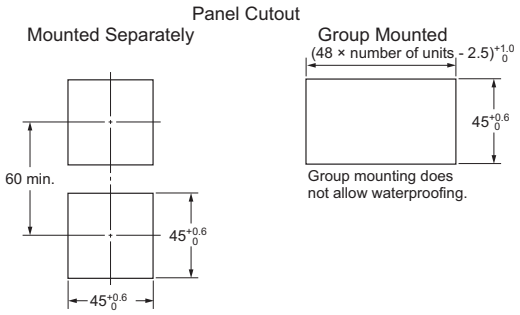
Dimensions

(Unit: mm)

Controllers

E5CC



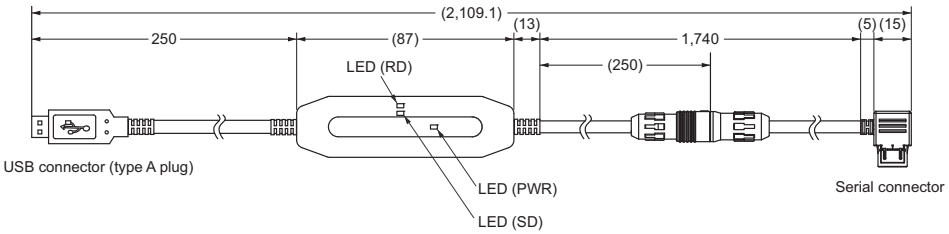


- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

Accessories (Order Separately)

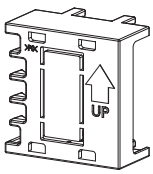
● USB-Serial Conversion Cable

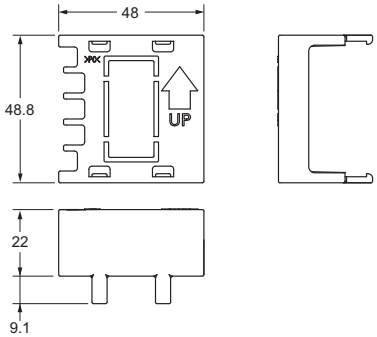
E58-CIFQ2



● Terminal Covers

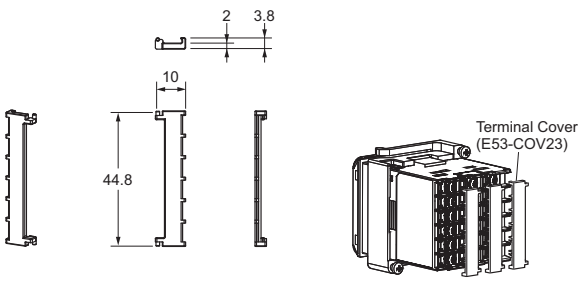
E53-COV17



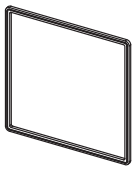


● Terminal Covers

E53-COV23 (Three Covers provided.)



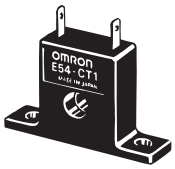
● Waterproof Packing
Y92S-P8 (for DIN 48 × 48)

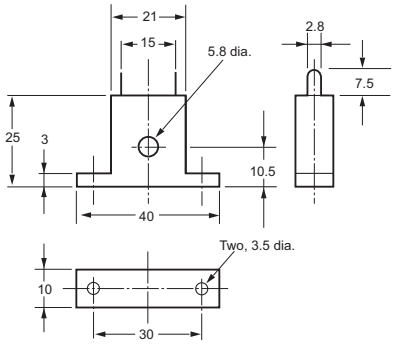


Order the Waterproof Packing separately if it becomes lost or damaged.
The Waterproof Packing can be used to achieve an IP66 degree of protection.
(Deterioration, shrinking, or hardening of the waterproof packing may occur depending on the operating environment. Therefore, periodic replacement is recommended to ensure the level of waterproofing specified in IP66. The time for periodic replacement depends on the operating environment. Be sure to confirm this point at your site.
Consider three years a rough standard. OMRON shall not be liable for the level of water resistance if the customer does not perform periodic replacement.)
The Waterproof Packing does not need to be attached if a waterproof structure is not required.

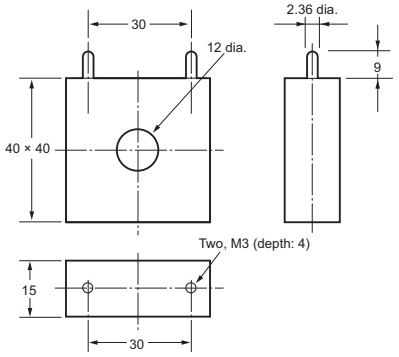
● Current Transformers

E54-CT1



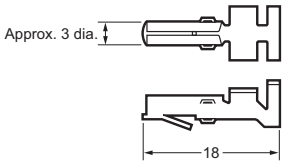


E54-CT3

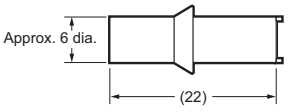


E54-CT3 Accessory

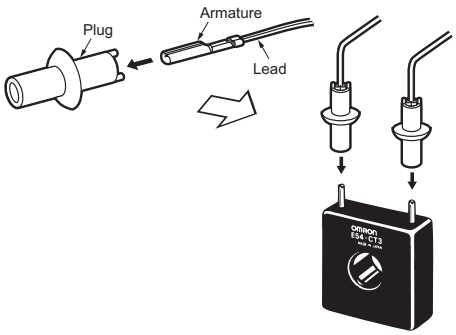
• Armature



• Plug

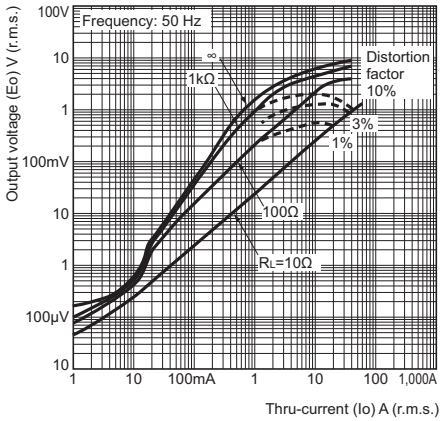


Connection Example



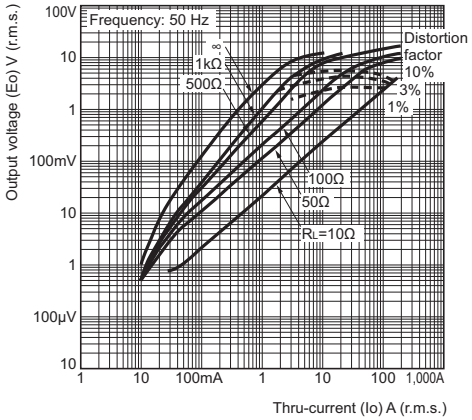
Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)
E54-CT1

Maximum continuous heater current: 50 A (50/60 Hz)
Number of windings: 400±2
Winding resistance: 18±2 Ω



Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)
E54-CT3

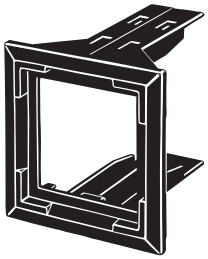
Maximum continuous heater current: 120 A (50/60 Hz)
(Maximum continuous heater current for an OMRON Digital Temperature Controller is 50 A.)
Number of windings: 400±2
Winding resistance: 8±0.8 Ω

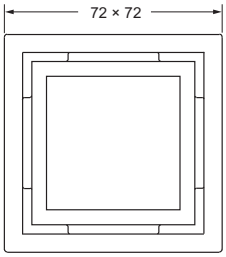


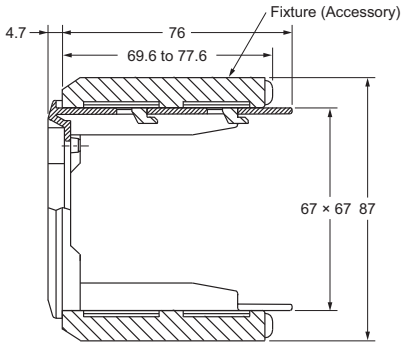
● Adapter

Y92F-45

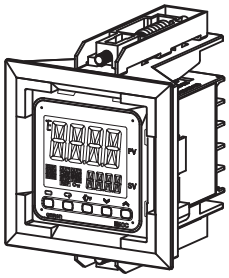
Note: 1. Use this Adapter when the Front Panel has already been prepared for the E5B□.
2. Only black is available.
3. You cannot use the E58-CIFQ2 USB-Serial Conversion Cable if you use the Y92F-45 Adapter. To use the USB-Serial Conversion Cable to make the settings, do so before you mount the Temperature Controller in the panel.

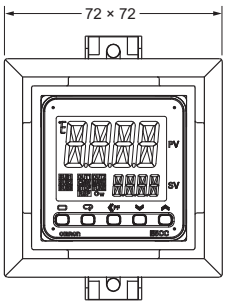


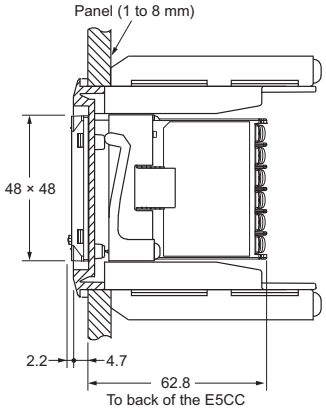




Mounted to E5CC

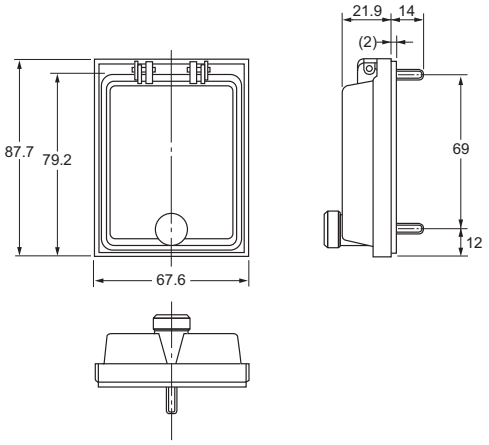






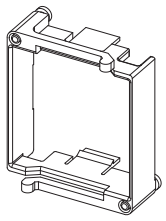
● Watertight Cover

Y92A-48N



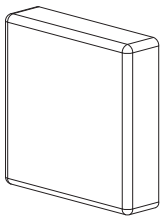
● Mounting Adapter

Y92F-49



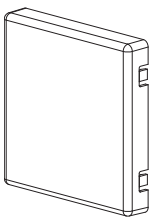
● Protective Cover

Y92A-48D



● Protective Cover

Y92A-48H



Digital Temperature Controller
E5EC (48 × 96 mm)

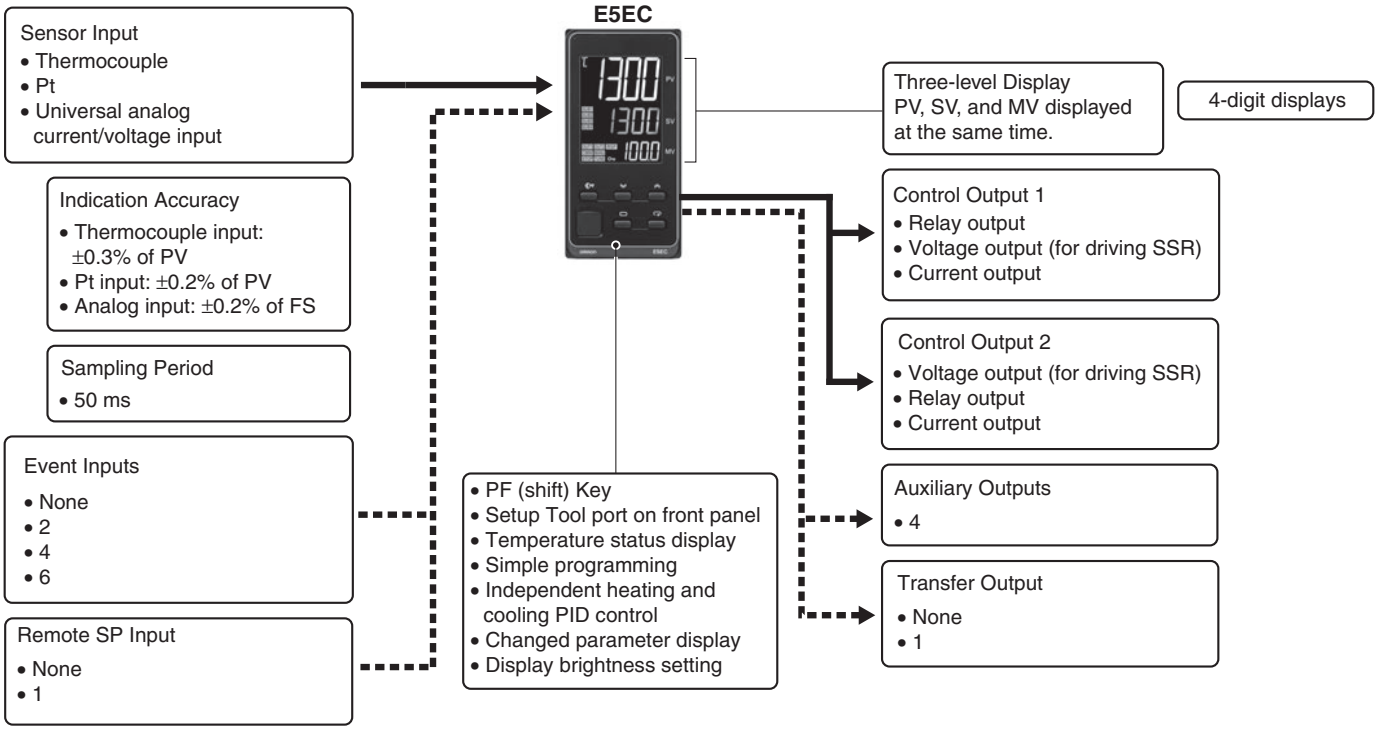
Large White PV Display That's Easier to Read. Easy to Use, from Model Selection to Setup and Operation. A Complete Range of I/O Capacities, Functions, and Performance. Handles More Applications.

- A white LCD PV display with a height of approx. 18 mm improves visibility.
- Easily connect the CX-Thermo (sold separately) through a USB-Serial Conversion Cable (sold separately) to a Setup Tool port on the top panel or on the front panel. The Digital Temperature Controller receives the power required for setup from the computer through the USB bus power source.
  Settings can be made from CX-Thermo or the front panel of the Digital Temperature Controller without wiring the power supply.
- High-speed sampling at 50 ms.
- Models with up to 4 auxiliary outputs, 6 event inputs, a transfer output, and remote SP input added to the lineup. Complete selection of I/O capacities.
- Short body with depth of only 60 mm.

48 × 96 mm
E5EC

⚠ **Refer to Safety Precautions on page 30.**

Main I/O Functions



This datasheet is provided as a guideline for selecting products.
Be sure to refer to the following manuals for application precautions and other information required for operation before attempting to use the product.
E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174)
E5CC/E5EC Digital Controllers Communications Manual (Cat. No. H175)

Model Number Legend and Standard Models

Model Number Legend

E5EC-□□ □ □ □ □ □-□□□ (Example: E5EC-RX4A5M-000)

①②③④⑤⑥

Model	① Control outputs 1 and 2	② No. of auxiliary outputs	③ Power supply voltage	④ Terminal type	⑤ Input type	⑥ Options	Meaning	
E5EC							48 × 96 mm	
							Control output 1	Control output 2
*1	RX						Relay output	None
*1	QX						Voltage output (for driving SSR)	None
*1, *2	CX						Linear current output	None
*1	QQ						Voltage output (for driving SSR)	Voltage output (for driving SSR)
*1	QR						Voltage output (for driving SSR)	Relay output
*1	RR						Relay output	Relay output
*1, *2	CC						Linear current output	Linear current output
		*3 4					4 (auxiliary outputs 1 and 2 with same common and auxiliary outputs 3 and 4 with same common)	
			A				100 to 240 VAC	
			D				24 VAC/DC	
				5			Screw terminals (with cover)	
					M		Universal input	

Option selection conditions *1	Control outputs 1 and 2			HB alarm and HS alarm	Communications	Event inputs	Remote SP Input	Transfer output
	For RX, QX, QQ, QR, or RR	For CX or CC						
	Selectable	Selectable	000	---	---	---	---	---
		Selectable	004	---	RS-485	2	---	---
		Selectable	005	---	---	4	---	---
	Selectable		009	2 (for 3-phase heaters)	RS-485	2	---	---
	Selectable		010	1	---	4	---	---
	Selectable		011	1	---	6	Provided.	Provided.
		Selectable	013	---	---	6	Provided.	Provided.
		Selectable	014	---	RS-485	4	Provided.	Provided.

*1. The options that can be selected depend on the type of control output.
*2. The control output cannot be used as a transfer output.
*3. A model with four auxiliary outputs must be selected.

Heating and Cooling Control

I Using Heating and Cooling Control

① Control Output Assignment
If there is no control output 2, an auxiliary output is used as the cooling control output.
If there is a control output 2, the two control outputs are used for heating and cooling.
(It does not matter which output is used for heating and which output is used for cooling.)
② Control
If PID control is used, you can set PID control separately for heating and cooling.
This allows you to handle control systems with different heating and cooling response characteristics.

Optional Products (Order Separately)

USB-Serial Conversion Cable

Model
E58-CIFQ2

Communications Conversion Cable

Model
E58-CIFQ2-E

Note: Always use this product together with the E58-CIFQ2.

Terminal Covers

Model
E53-COV24

Waterproof Packing

Model
Y92S-P9

Note: This Waterproof Packing is provided with the Digital Temperature Controller.

Waterproof Cover

Model
Y92A-49N

Note: This Cover complies with IP66 and NEMA 4X waterproofing. Front panel: IP66 protection.

Front Port Cover

Model
Y92S-P7

Note: This Front Port Cover is provided with the Digital Temperature Controller.

Mounting Adapter

Model
Y92F-51 (Two Adapters are included.)

Note: This Mounting Adapter is provided with the Digital Temperature Controller.

Current Transformers (CTs)

Hole diameter	Model
5.8 mm	E54-CT1
12.0 mm	E54-CT3

CX-Thermo Support Software

Model
EST2-2C-MV4

Note: CX-Thermo version 4.4 or higher is required for the E5EC.

Specifications

Ratings

Power supply voltage		A in model number: 100 to 240 VAC, 50/60 Hz D in model number: 24 VAC, 50/60 Hz; 24 VDC
Operating voltage range		85% to 110% of rated supply voltage
Power consumption		Models with option selection of 000:6.6 VA max. at 100 to 240 VAC, and 4.1 VA max. at 24 VDC or 2.3 W max. at 24 VDC All other models: 8.3 VA max. at 100 to 240 VAC, and 5.5 VA max. at 24 VDC or 3.2 W max. at 24 VDC
Sensor input		Models with temperature inputs Thermocouple: K, J, T, E, L, U, N, R, S, B, W, or PL II Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor: 10 to 70°C, 60 to 120°C, 115 to 165°C, or 140 to 260°C Analog input Current input: 4 to 20 mA or 0 to 20 mA Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V
Input impedance		Current input: 150 Ω max., Voltage input: 1 MΩ min. (Use a 1:1 connection when connecting the ES2-HB/THB.)
Control method		ON/OFF or, for any model with two control outputs, 2-PID (with autotuning) control
Control output	**Relay output**	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA
	Voltage output (for driving SSR)	Output voltage: 12 VDC ±20% (PNP), max. load current: 40 mA, with short-circuit protection circuit (The maximum load current is 21 mA for models with two control outputs.)
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000
Auxiliary output	**Number of outputs**	4
	Output specifications	N.O. relay outputs, 250 VAC, Models with 4 outputs: 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V
Event input	**Number of inputs**	2, 4 or 6 (depends on model)
	External contact input specifications	Contact input: ON: 1 kΩ max., OFF: 100 kΩ min.
		Non-contact input: ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.
		Current flow: Approx. 7 mA per contact
Transfer output	**Number of outputs**	1 (only on models with a transfer output)
	Output specifications	Current output: 4 to 20 mA DC, Load: 500 Ω max., Resolution: Approx. 10,000 Linear voltage output: 1 to 5 VDC, load: 1 Ω max, Resolution: Approx. 10,000
Remote SP input		Current input: 4 to 20 mA DC or 0 to 20 mA DC (input impedance: 150 Ω max.) Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V (input impedance: 1 MΩ min.)
Setting method		Digital setting using front panel keys
Indication method		11-segment digital display and individual indicators Character height: PV: 18.0 mm, SV: 11.0 mm, MV: 7.8 mm Three displays Contents: PV/SV/MV, PV/SV/Multi-SP, or PV/SV/Remaining soak time Numbers of digits: 4 digits each for PM, SV, and MV displays
Multi SP		Up to eight set points (SP0 to SP7) can be saved and selected using event inputs, key operations, or serial communications.
Bank switching		None
Other functions		Manual output, heating/cooling control, loop burnout alarm, SP ramp, other alarm functions, heater burnout (HB) alarm (including SSR failure (HS) alarm), 40% AT, 100% AT, MV limiter, input digital filter, self tuning, robust tuning, PV input shift, run/stop, protection functions, extraction of square root, MV change rate limit, simple calculations, temperature status display, simple programming, moving average of input value, and display brightness setting
Ambient operating temperature		-10 to 55°C (with no condensation or icing), for 3-year warranty: -10 to 50°C (with no condensation or icing)
Ambient operating humidity		25% to 85%
Storage temperature		-25 to 65°C (with no condensation or icing)

Input Ranges

●Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Input type	Platinum resistance thermometer					Thermocouple															Infrared temperature sensor			
Name	Pt100			JPt100		K		J		T		E	L	U		N	R	S	B	W	PLII	10 to 70°C	60 to 120°C	115 to 165°C	140 to 260°C
Temperature range (°C)	850 / -200	500.0 / -199.9	100.0 / 0.0	500.0 / -199.9	100.0 / 0.0	1300 / -200	500.0 / -20.0	850 / -100	400.0 / -20.0	400 / -200	400.0 / -199.9	600 / -200	850 / -100	400 / -200	400.0 / -199.9	1300 / -200	1700 / 0	1700 / 0	1800 / 100	2300 / 0	1300 / 0	90 / 0	120 / 0	165 / 0	260 / 0
Setting range	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Shaded settings are the default settings.

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: JIS C 1602-1995, IEC 60584-1

L: Fe-CuNi, DIN 43710-1985

U: Cu-CuNi, DIN 43710-1985

W: W5Re/W26Re, ASTM E988-1990

JPt100: JIS C 1604-1989, JIS C 1606-1989

Pt100: JIS C 1604-1997, IEC 60751

PL II: According to Platinel II electromotive force charts from BASF (previously Engelhard)

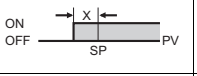
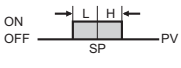
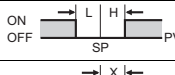
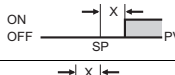
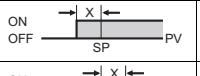
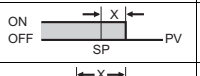
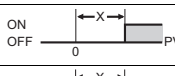
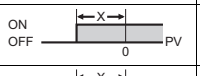
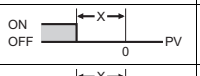
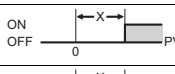
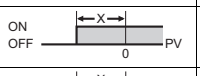
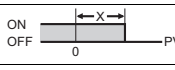
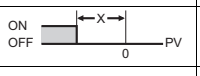
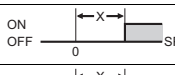
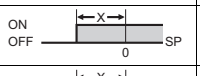
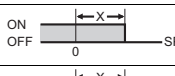
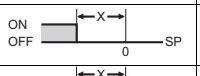
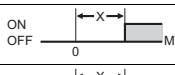
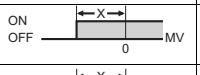
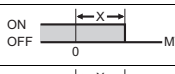
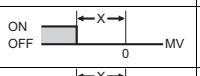
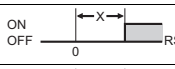
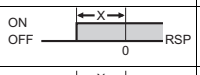
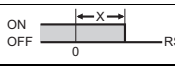
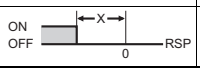
●Analog input

Input type	Current		Voltage		
Input specification	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Setting range	Usable in the following ranges by scaling: -1999 to 9999, -199.9 to 999.9, -19.99 to 99.99 or -1.999 to 9.999				
Setting number	25	26	27	28	29

Alarm type

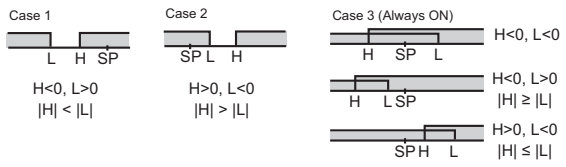
Each alarm can be independently set to one of the following 19 alarm types. The default is 2: Upper limit. (see note.)
Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

Note: In the default settings for models with HB or HS alarms, alarm 1 is set to a heater alarm (HA) and the Alarm Type 1 parameter is not displayed. To use alarm 1, set the output assignment to alarm 1.

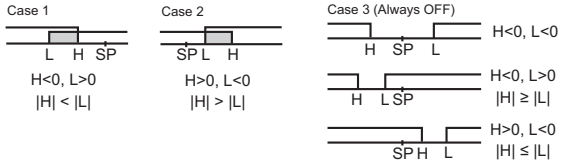
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1		*2	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2	Upper-limit			Set the upward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is higher than the SP by the deviation or more.
3	Lower-limit			Set the downward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is lower than the SP by the deviation or more.
4	Upper- and lower-limit range *1		*3	Set the deviation in the set point by setting the alarm upper limit (H) and alarm lower limit (L). The alarm is ON when the PV is inside this deviation range.
5	Upper- and lower-limit with standby sequence *1	*5 	*4	A standby sequence is added to the upper- and lower-limit alarm (1).*6
6	Upper-limit with standby sequence			A standby sequence is added to the upper-limit alarm (2). *6
7	Lower-limit with standby sequence			A standby sequence is added to the lower-limit alarm (3).*6
8	Absolute-value upper-limit			The alarm will turn ON if the process value is larger than the alarm value (X) regardless of the set point.
9	Absolute-value lower-limit			The alarm will turn ON if the process value is smaller than the alarm value (X) regardless of the set point.
10	Absolute-value upper-limit with standby sequence			A standby sequence is added to the absolute-value upper-limit alarm (8). *6
11	Absolute-value lower-limit with standby sequence			A standby sequence is added to the absolute-value lower-limit alarm (9). *6
12	LBA (alarm 1 type only)	-		*7
13	PV change rate alarm	-		*8
14	SP absolute value upper limit			This alarm type turns ON the alarm when the set point (SP) is higher than the alarm value (X).
15	SP absolute value lower limit			This alarm type turns ON the alarm when the set point (SP) is smaller than the alarm value (X).
16	MV absolute value upper limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is higher than the alarm value (X).
17	MV absolute value lower limit *9			This alarm type turns ON the alarm when the manipulated variable (MV) is smaller than the alarm value (X).
18	RSP absolute value upper limit *10			The alarm will turn ON when the remote SP (RSP) is larger than the alarm value (X).
19	RSP absolute value lower limit *10			The alarm will turn ON when the remote SP (RSP) is smaller than the alarm value (X).

*1 With set values 1, 4 and 5, the upper and lower limit values can be set ndependently for each alarm type, and are expressed as “L” and “H.”

*2. Set value: 1, Upper- and lower-limit alarm



*3. Set value: 4, Upper- and lower-limit range



*4. Set value: 5, Upper- and lower-limit with standby sequence
For Upper- and Lower-Limit Alarm Described Above *2

- Case 1 and 2
  Always OFF when the upper-limit and lower-limit hysteresis overlaps.
- Case 3: Always OFF

*5. Set value: 5, Upper- and lower-limit with standby sequence
Always OFF when the upper-limit and lower-limit hysteresis overlaps.

*6. Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174) for information on the operation of the standby sequence.

*7. Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174) for information on the PV change rate alarm.

*8. Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174) for information on the PV change rate alarm.

*9. When heating/cooling control is performed, the MV absolute upper limit alarm functions only for the heating operation and the MV absolute lower limit alarm functions only for the cooling operation.

*10. This value is displayed only when a remote SP input is used. It functions in both Local SP Mode and Remote SP Mode.

Characteristics

Indication accuracy (at the ambient temperature of 23°C)		Thermocouple: (±0.3% of indicated value or ±1°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indicated value or ±0.8°C, whichever is greater) ±1 digit Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max.
Transfer output accuracy		±0.3% FS max.
Remote SP Input Type		±0.2% FS ±1 digit max.
Influence of temperature *2		Thermocouple input (R, S, B, W, PL II): (±1% of PV or ±10°C, whichever is greater) ±1 digit max. Other thermocouple input: (±1% of PV or ±4°C, whichever is greater) ±1 digit max. *3 Platinum resistance thermometer: (±1% of PV or ±2°C, whichever is greater) ±1 digit max. Analog input: (±1%FS) ±1 digit max. CT input: (±5% FS) ±1 digit max. Remote SP input: (±1% FS) ±1 digit max.
Influence of voltage *2		
Input sampling period		50ms
Hysteresis		Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or°F) *4 Analog input: 0.01% to 99.99% FS (in units of 0.01% FS)
Proportional band (P)		Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) *4 Analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I)		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Derivative time (D)		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Proportional band (P) for cooling		Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) *4 Analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I) for cooling		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Derivative time (D) for cooling		0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *5
Control period		0.1, 0.2, 0.5, 1 to 99 s (in units of 1 s)
Manual reset value		0.0 to 100.0% (in units of 0.1%)
Alarm setting range		-1999 to 9999 (decimal point position depends on input type)
Affect of signal source resistance		Thermocouple: 0.1°C/Ω max. (100 Ω max.) Platinum resistance thermometer: 0.1°C/Ω max. (10 Ω max.)
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		2,300 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)
Vibration	**resistance**	10 to 55 Hz, 20 m/s² for 10 min each in X, Y, and Z directions
	Malfunction	10 to 55 Hz, 20 m/s² for 2 hrs each in X, Y, and Z directions
Destruction	**resistance**	100 m/s², 3 times each in X, Y, and Z directions
	Malfunction	300 m/s², 3 times each in X, Y, and Z directions
Weight		Controller: Approx. 210 g, Mounting Bracket: Approx. 4 g × 2
Degree of protection		Front panel: IP66, Rear case: IP20, Terminals: IP00
Memory protection		Non-volatile memory (number of writes: 1,000,000 times)
Setup Tool		CX-Thermo version 4.4 or higher
Setup Tool port		E5EC top panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect a USB port on the computer with the port on the top panel of the E5EC.*6 E5EC front panel: An E58-CIFQ2 USB-Serial Conversion Cable and E58-CIFQ2-E Conversion Cable are used together to connect a USB port on the computer with the port on the front panel of the E5EC.*6
Standards	**Approved standards**	UL 61010-1, CSA C22.2 No. 611010-1 (evaluated by UL)
	Conformed standards	EN 61010-1 (IEC 61010-1): Pollution level 2, overcurrent category II
EMC		EMI: EN61326 Radiated Interference Electromagnetic Field Strength: EN 55011 Group 1, class A Noise Terminal Voltage: EN 55011 Group 1, class A EMS: EN 61326 ESD Immunity: EN 61000-4-2 Electromagnetic Field Immunity: EN 61000-4-3 Burst Noise Immunity: EN 61000-4-4 Conducted Disturbance Immunity: EN 61000-4-6 Surge Immunity: EN 61000-4-5 Voltage Dip/Interrupting Immunity: EN 61000-4-11

*1. The indication accuracy of K thermocouples in the -200 to 1300°C range, T and N thermocouples at a temperature of -100°C max., and U and L thermocouples at any temperatures is ±2°C ±1 digit max. The indication accuracy of the B thermocouple at a temperature of 400°C max. is not specified. The indication accuracy of B thermocouples in the 400 to 800°C range is ±3°C max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max. The indication accuracy of W thermocouples is ±0.3 of PV or ±3°C, whichever is greater, ±1 digit max. The indication accuracy of PL II thermocouples is ±0.3 of PV or ±2°C, whichever is greater, ±1 digit max.
*2. Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to 10% of rated voltage
*3. K thermocouple at -100°C max.: ±10°C max.
*4. "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is °C or °F.
*5. The unit is determined by the setting of the Integral/Derivative Time Unit parameter.
*6. External communications (RS-485) and USB-serial conversion cable communications can be used at the same time.

USB-Serial Conversion Cable

Applicable OS	Windows 2000, XP, Vista, or 7
Applicable software	CX-Thermo version 4.4 or higher
Applicable models	E5CC/E5EC and E5CB
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38,400 bps
Connector specifications	Computer: USB (type A plug) Digital Temperature Controller: Setup Tool port
Power supply	Bus power (Supplied from USB host controller.)*
Power supply voltage	5 VDC
Current consumption	450 mA max.
Output voltage	4.7±0.2 VDC (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Output current	250 mA max. (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Ambient operating temperature	0 to 55°C (with no condensation or icing)
Ambient operating humidity	10% to 80%
Storage temperature	-20 to 60°C (with no condensation or icing)
Storage humidity	10% to 80%
Altitude	2,000 m max.
Weight	Approx. 120 g

* Use a high-power port for the USB port.

Note: A driver must be installed in the personal computer. Refer to installation information in the operation manual for the Conversion Cable.

Communications Specifications

Transmission line connection method	RS-485: Multipoint
Communications	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Protocol	CompoWay/F, or Modbus
Baud rate	19200, 38400, or 57600 bps
Transmission code	ASCII
Data bit length*	7 or 8 bits
Stop bit length*	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Block check character (BCC) with CompoWay/F or CRC-16 Modbus
Flow control	None
Interface	RS-485
Retry function	None
Communications buffer	217 bytes
Communications response wait time	0 to 99 ms Default: 20 ms

* The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

Current Transformer (Order Separately) Ratings

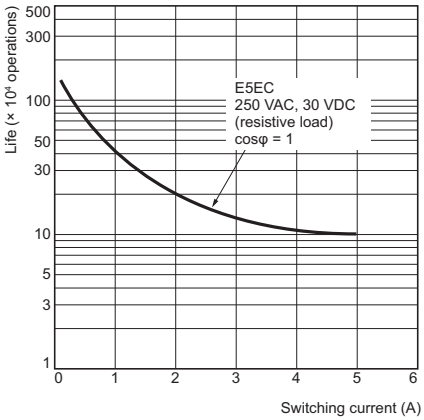
Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s^2
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

Heater Burnout Alarms and SSR Failure Alarms

CT input (for heater current detection)	Models with detection for singlephase heaters: One input Models with detection for singlephase or three-phase heaters: Two inputs
Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range *1	0.1 to 49.9 A (in units of 0.1 A) Minimum detection ON time: 100 ms *3
SSR failure alarm setting range *2	0.1 to 49.9 A (in units of 0.1 A) Minimum detection OFF time: 100 ms *4

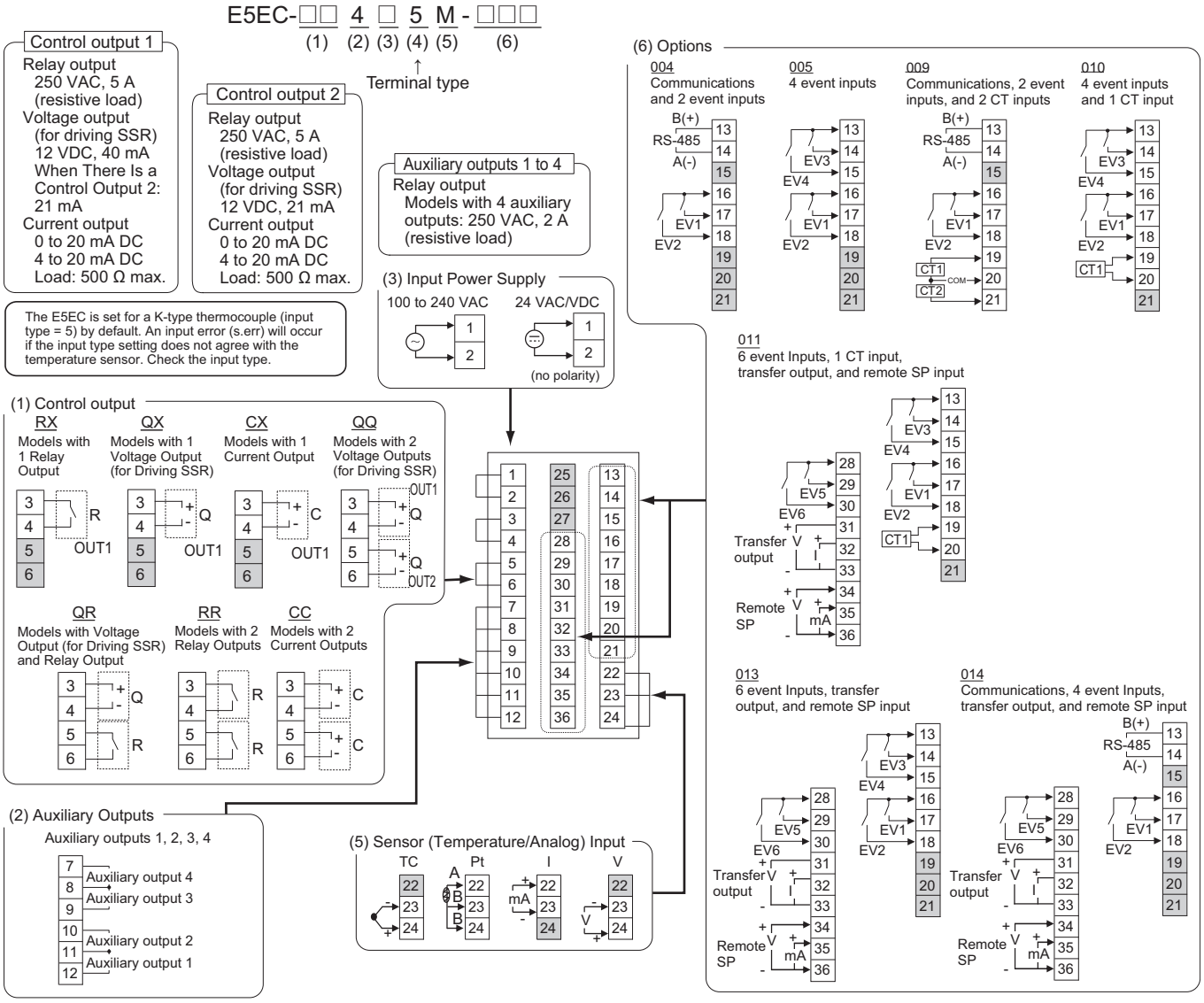
*1. For heater burnout alarms, the heater current will be measured when the control output is ON, and the output will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).
*2. For SSR failure alarms, the heater current will be measured when the control output is OFF, and the output will turn ON if the heater current is higher than the set value (i.e., SSR failure detection current value).
*3. The value is 30 ms for a control period of 0.1 s or 0.2 s.
*4. The value is 35 ms for a control period of 0.1 s or 0.2 s.

Electrical Life Expectancy Curve for Relays (Reference Values)



External Connections

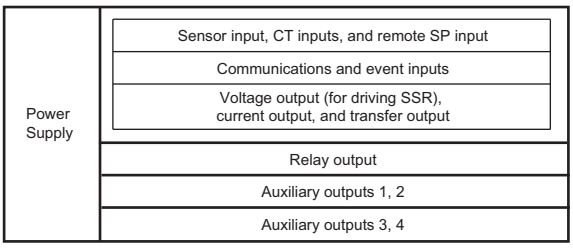
E5EC



Note: 1. The application of the terminals depends on the model.
2. Do not wire the terminals that are shown with a gray background.
3. When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
4. Connect M3 crimped terminals.

Isolation/Insulation Block Diagrams

Models with 4 Auxiliary Outputs

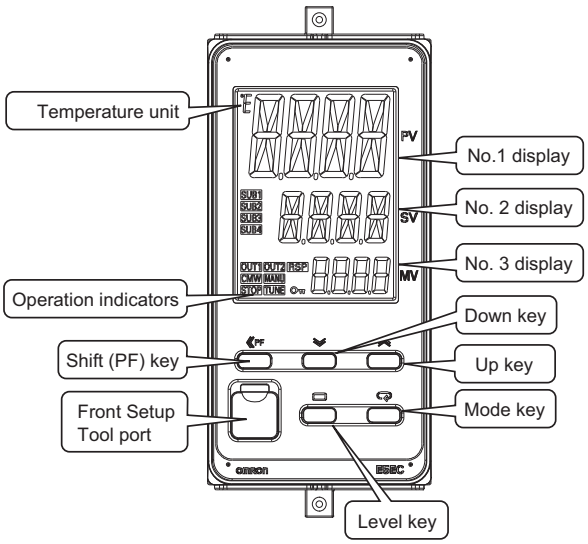

Power Supply
Sensor input, CT inputs, and remote SP input
Communications and event inputs
Voltage output (for driving SSR), current output, and transfer output
Relay output
Auxiliary outputs 1, 2
Auxiliary outputs 3, 4

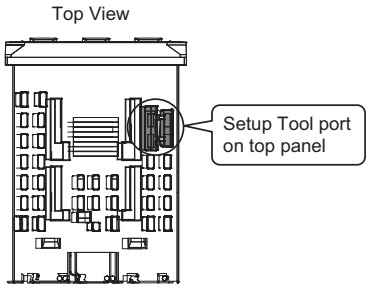
: Reinforced insulation

: Functional isolation

Nomenclature

E5EC



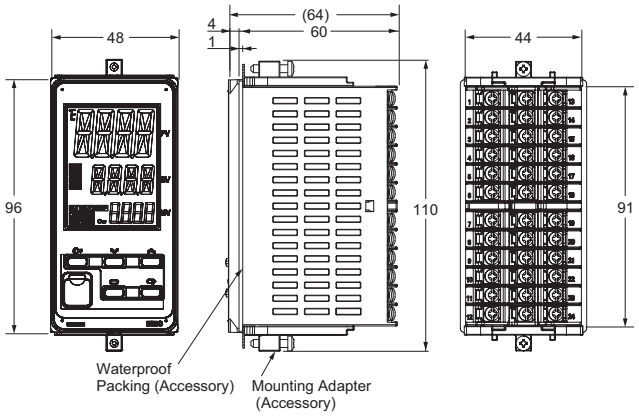


Dimensions

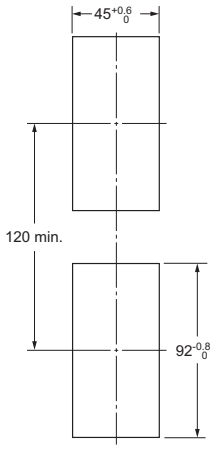
(Unit: mm)

Controllers

E5EC

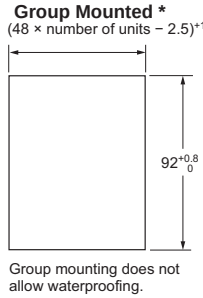


Mounted Separately



Group Mounted *

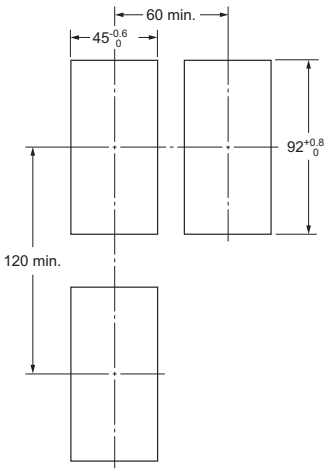
(48 × number of units − 2.5)+1.0 0



Group mounting does not allow waterproofing.

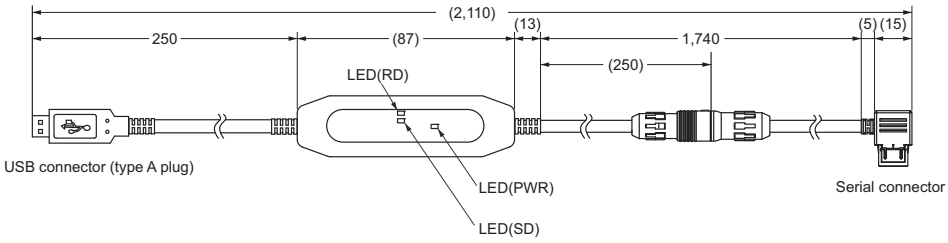
- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

* Selections for Control Outputs 1 and 2: QQ, QR, RR, or CC
If you also specify 011, 013, or 014 for the option selection and use group mounting, the ambient temperature must be 45°C or less. If the ambient temperature is 55°C, maintain the following mounting spaces between Controllers.



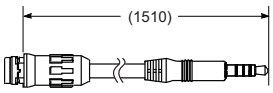
Accessories (Order Separately)

● USB-Serial Conversion Cable
E58-CIFQ2

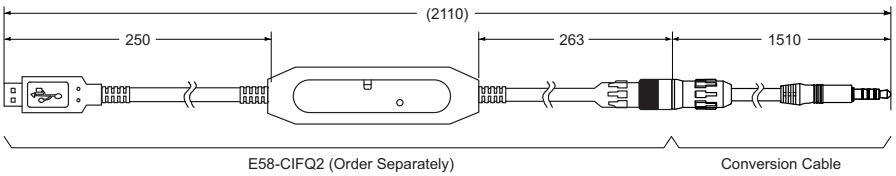


● Conversion Cable
E58-CIFQ2-E

Conversion Cable

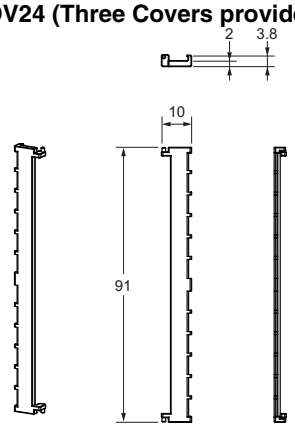


Connecting to the E58-CIFQ2 USB-Serial Conversion Cable

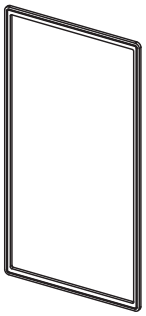


Note: Always use this product together with the E58-CIFQ2.

● Terminal Covers
E53-COV24 (Three Covers provided.)

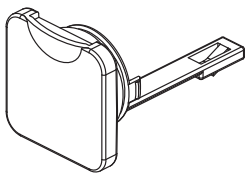


● Waterproof Packing
Y92S-P9 (for DIN 48 × 96)



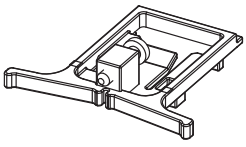
The following degrees of protection apply. The structure is not waterproof for any part for which the degree of protection is not specified or for any part with IP□0 protection.
Front panel: IP66, Rear case: IP20, Terminal section: IP00
When waterproofing is required, fit Watertight Packing on the backside of front panel. Keep the Port Cover on the front-panel Setup Tool port of the E5EC securely closed. The degree of protection when the Waterproof Packing is used is IP66. To maintain an IP66 degree of protection, the Waterproof Packed and the Port Cover for the front-panel Setup Tool port must be periodically replaced because they may deteriorate, shrink, or harden depending on the operating environment. The replacement period will vary with the operating environment. Check the required period in the actual application. Use 3 years or sooner as a guideline. If the Waterproof Packing and Port Cover are not periodically replaced, waterproof performance may not be maintained. If a waterproof structure is not required, then the Waterproof Packing does not need to be installed.

● Setup Tool Port Cover for top panel
Y92S-P7



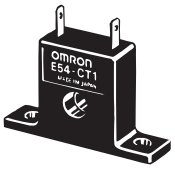
Order this Port Cover separately if the Port Cover on the front-panel Setup Tool port is lost or damaged. The Waterproof Packing must be periodically replaced because it may deteriorate, shrink, or harden depending on the operating environment.

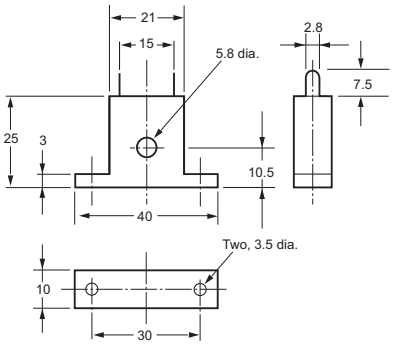
● Mounting Adapter
Y92F-51 (for DIN 48 × 96)



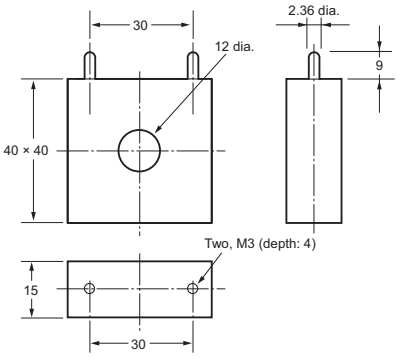
● Current Transformers

E54-CT1



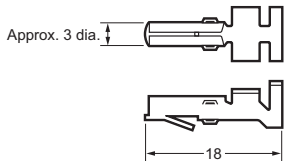


E54-CT3

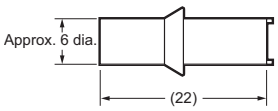


E54-CT3 Accessory

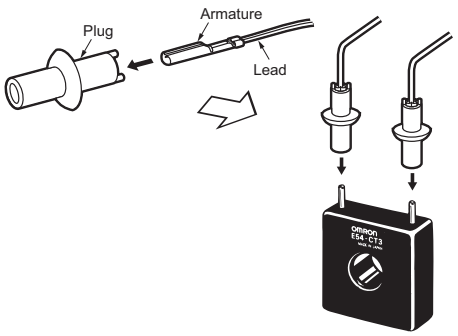
• Armature



• Plug

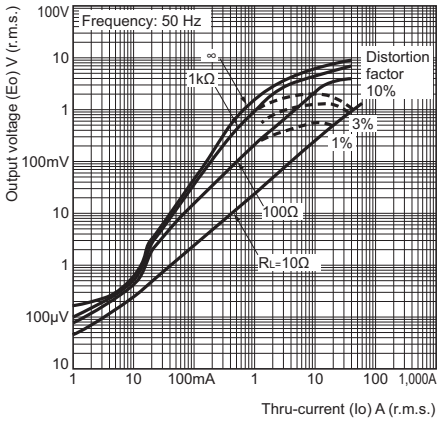


Connection Example



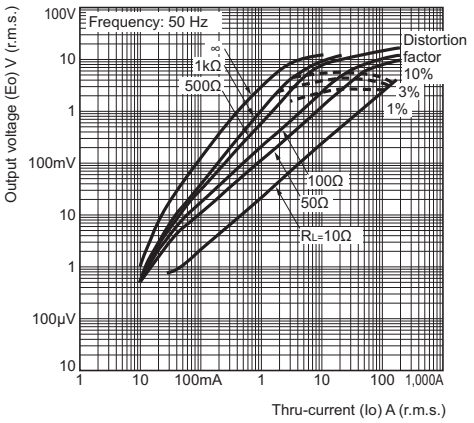
Thru-current (Io) vs. Output Voltage (Eo) (Reference Values) E54-CT1

Maximum continuous heater current: 50 A (50/60 Hz)
Number of windings: 400±2
Winding resistance: 18±2 Ω



Thru-current (Io) vs. Output Voltage (Eo) (Reference Values) E54-CT3

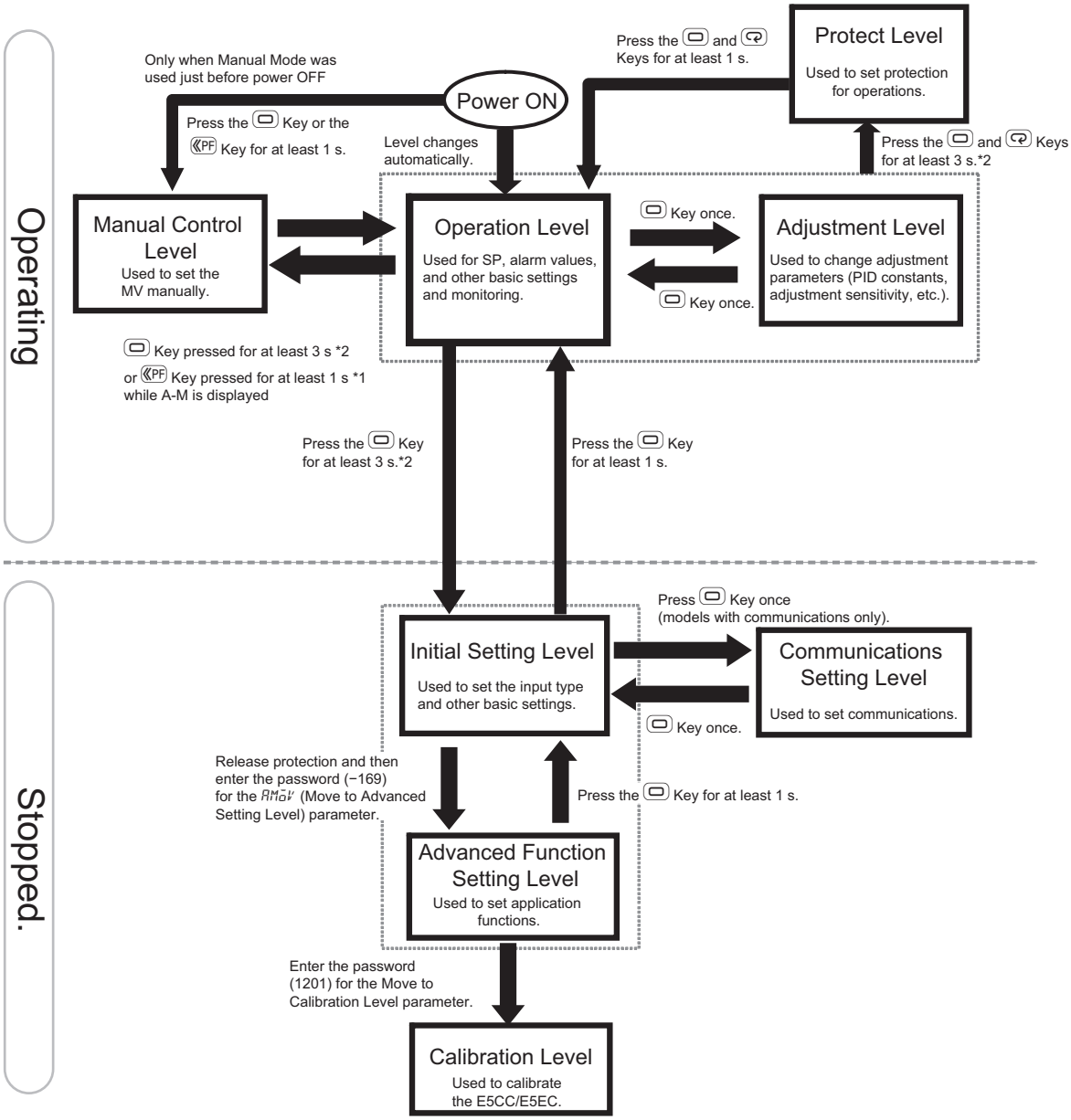
Maximum continuous heater current: 120 A (50/60 Hz)
(Maximum continuous heater current for an OMRON Digital Temperature Controller is 50 A.)
Number of windings: 400±2
Winding resistance: 8±0.8 Ω



Operation

Setting Levels Diagram

This diagram shows all of the setting levels. To move to the advanced function setting level and calibration level, you must enter passwords. Some parameters are not displayed depending on the protect level setting and the conditions of use.
Control stops when you move from the operation level to the initial setting level.


Operating
Stopped.
Only when Manual Mode was used just before power OFF
Power ON
Press the Key or the PF Key for at least 1 s.
Level changes automatically.
Press the and Keys for at least 1 s.
Protect Level
Used to set protection for operations.
Press the and Keys for at least 3 s.*2
Manual Control Level
Used to set the MV manually.
Operation Level
Used for SP, alarm values, and other basic settings and monitoring.
Key once.
Key once.
Adjustment Level
Used to change adjustment parameters (PID constants, adjustment sensitivity, etc.).
Key pressed for at least 3 s *2
or PF Key pressed for at least 1 s *1
while A-M is displayed
Press the Key for at least 3 s.*2
Press the Key for at least 1 s.
Press Key once
(models with communications only).
Initial Setting Level
Used to set the input type and other basic settings.
Communications Setting Level
Used to set communications.
Key once.
Release protection and then enter the password (−169) for the AMOV (Move to Advanced Setting Level) parameter.
Press the Key for at least 1 s.
Advanced Function Setting Level
Used to set application functions.
Enter the password (1201) for the Move to Calibration Level parameter.
Calibration Level
Used to calibrate the E5CC/E5EC.

*1. To use a key procedure to move to Manual Control Level, set the Auto/Manual Select Addition parameter to ON and set the PF Setting parameter to A-M (Auto/Manual).
*2. The No. 1 display will flash in the middle when the keys are pressed for 1 s or longer.

Error Displays (Troubleshooting)

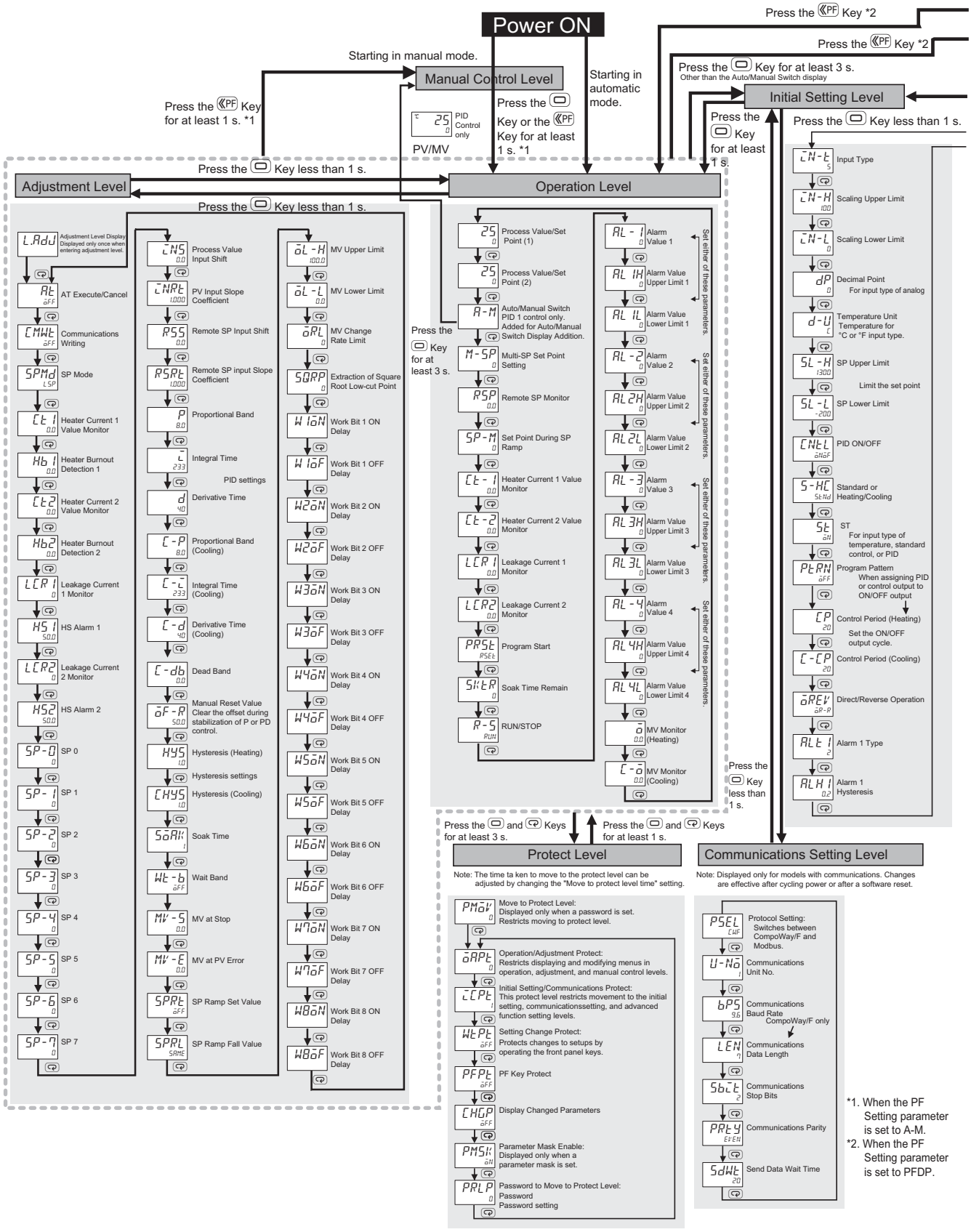
When an error occurs, the No. 1 display or No. 2 display shows the error code.
Take necessary measure according to the error code, referring the following table.

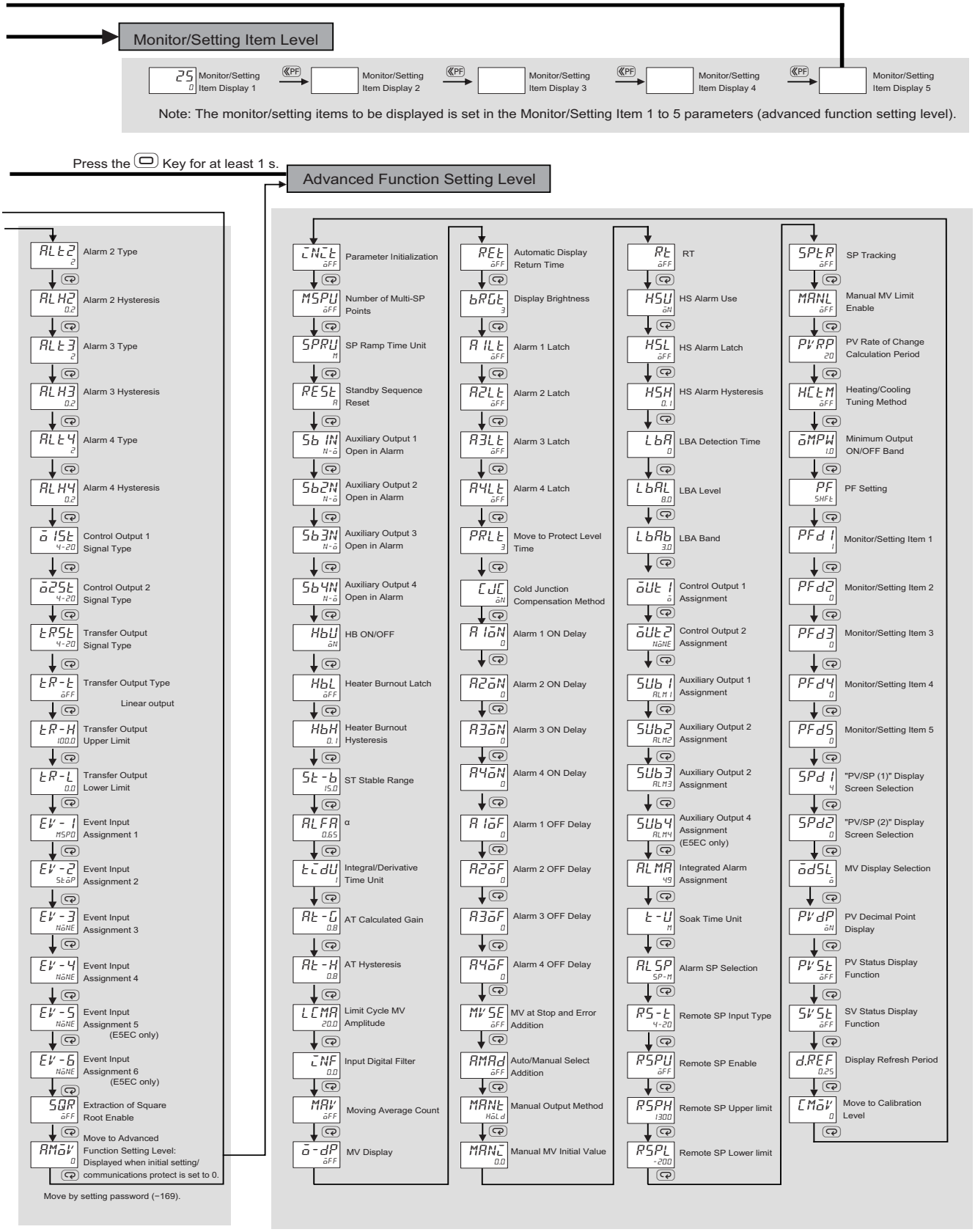
Display	Name	Meaning		Action	Operation
S.ERR	Input error	The input value exceeded the control range.* The input type is not set correctly. The sensor is disconnected or short-circuited. The sensor is not wired correctly. The sensor is not wired. * Control Range Temperature resistance thermometer or thermocouple input: SP Lower Limit - 20°C to SP Upper Limit + 20°C (SP Lower Limit - 40°F to SP Upper Limit + 40°F) ESIB input: Same as specified input range. Analog input: Scaling range -5% to 105%		Check the wiring for input to be sure it is wired correctly, not broken, and not shorted. Also check the input type. If there are no problems in the wiring or input type settings, cycle the power supply. If the display remains the same, replace the Digital Temperature Controller. If the display is restored to normal, then the probable cause is external noise affecting the control system. Check for external noise. **Note:** For a temperature resistance thermometer, the input is considered disconnected if the A, B, or B'line is broken.	After the error occurs and it is displayed, the alarm output will operate as if the upper limit was exceeded. It will also operate as if transfer output exceeded the upper limit. If an input error is assigned to a control output or auxiliary output, theoutput will turn ON when the input error occurs. The error message will appear in the display for the PV. **Note: 1.** The heating and cooling control outputs will turn OFF. **2.** When the manual MV, MV at stop, or MV at error is set, the control output is determined by the set value.
----- 33333	Display range exceeded	Below -1,999 Above 9,999	This is not an error. It is displayed when the control range is wider than the display range and the PV exceeds the display range. The PV is displayed for the range that is given on the left (the number without the decimal point).	-	Control continues and operation is normal. The value will appear in the display for the PV. Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174) for information on the controllable range.
E333	A/D converter error	There is an error in the internal circuits.		First, cycle the power supply. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	The control outputs, auxiliary outputs, and transfer outputs turn OFF. (A current output will be approx. 0 mA and a linear voltage output will be approx. 0V.)
E111	Memory error	There is an error in the internal memory operation.		First, cycle the power supply. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	The control outputs, auxiliary outputs, and transfer outputs turn OFF. (A current output will be approx. 0 mA and a linear voltage output will be approx. 0V.)
FFFF	Overcurrent	This error is displayed when the peak current exceeds 55.0 A.		-	Control continues and operation is normal. The error message will appear for the following displays. Heater Current Value 1 Monitor Heater Current Value 2 Monitor Leakage Current Value 1 Monitor Leakage Current Value 2 Monitor
CT1 CT2 LCR1 LCR2	HB or HS alarm	If there is a HB or HS alarm, the No. 1 display will flash in the relevant setting level.		-	The No. 1 display for the following parameter flashes in Operation Level or Adjustment Level. Heater Current Value 1 Monitor Heater Current Value 2 Monitor Leakage Current Value 1 Monitor Leakage Current Value 2 Monitor However, control continues and operation is normal.

Operation

Parameters

The related setting items in each level are described below. If you press the Mode Key at the last setting item, the display will return to the first setting item in the same level.


Power ON
Starting in manual mode.
Starting in automatic mode.
Manual Control Level
PID Control only
PV/MV
Press the PF Key for at least 1 s. *1
Press the Key or the PF Key for at least 1 s. *1
Press the PF Key *2
Press the PF Key *2
Press the Key for at least 3 s.
Other than the Auto/Manual Switch display
Initial Setting Level
Press the Key for at least 1 s.
Press the Key less than 1 s.
Adjustment Level
Press the Key less than 1 s.
Operation Level
Press the Key for at least 3 s.
Press the Key less than 1 s.
Protect Level
Communications Setting Level
Press the and Keys for at least 3 s.
Press the and Keys for at least 1 s.
Set either of these parameters.
Input Type
Scaling Upper Limit
Scaling Lower Limit
Decimal Point
Temperature Unit
SP Upper Limit
SP Lower Limit
PID ON/OFF
Standard or Heating/Cooling
ST
Program Pattern
Control Period (Heating)
Control Period (Cooling)
Direct/Reverse Operation
Alarm 1 Type
Alarm 1 Hysteresis
Process Value/Set Point (1)
Process Value/Set Point (2)
Auto/Manual Switch
Multi-SP Set Point
Remote SP Monitor
Set Point During SP Ramp
Heater Current 1 Value Monitor
Heater Current 2 Value Monitor
Leakage Current 1 Monitor
Leakage Current 2 Monitor
Program Start
Soak Time Remain
RUN/STOP
Alarm Value 1
Alarm Value Upper Limit 1
Alarm Value Lower Limit 1
Alarm Value 2
Alarm Value Upper Limit 2
Alarm Value Lower Limit 2
Alarm Value 3
Alarm Value Upper Limit 3
Alarm Value Lower Limit 3
Alarm Value 4
Alarm Value Upper Limit 4
Alarm Value Lower Limit 4
MV Monitor (Heating)
MV Monitor (Cooling)
Adjustment Level Display
AT Execute/Cancel
Communications Writing
SP Mode
Heater Current 1 Value Monitor
Heater Burnout Detection 1
Heater Current 2 Value Monitor
Heater Burnout Detection 2
Leakage Current 1 Monitor
HS Alarm 1
Leakage Current 2 Monitor
HS Alarm 2
SP 0
SP 1
SP 2
SP 3
SP 4
SP 5
SP 6
SP 7
Process Value Input Shift
PV Input Slope Coefficient
Remote SP Input Shift
Remote SP input Slope Coefficient
Proportional Band
Integral Time
PID settings
Derivative Time
Proportional Band (Cooling)
Integral Time (Cooling)
Derivative Time (Cooling)
Dead Band
Manual Reset Value
Clear the offset during stabilization of P or PD control.
Hysteresis (Heating)
Hysteresis settings
Hysteresis (Cooling)
Soak Time
Wait Band
MV at Stop
MV at PV Error
SP Ramp Set Value
SP Ramp Fall Value
MV Upper Limit
MV Lower Limit
MV Change Rate Limit
Extraction of Square Root Low-cut Point
Work Bit 1 ON Delay
Work Bit 1 OFF Delay
Work Bit 2 ON Delay
Work Bit 2 OFF Delay
Work Bit 3 ON Delay
Work Bit 3 OFF Delay
Work Bit 4 ON Delay
Work Bit 4 OFF Delay
Work Bit 5 ON Delay
Work Bit 5 OFF Delay
Work Bit 6 ON Delay
Work Bit 6 OFF Delay
Work Bit 7 ON Delay
Work Bit 7 OFF Delay
Work Bit 8 ON Delay
Work Bit 8 OFF Delay
Move to Protect Level:
Displayed only when a password is set.
Restricts moving to protect level.
Operation/Adjustment Protect:
Restricts displaying and modifying menus in operation, adjustment, and manual control levels.
Initial Setting/Communications Protect:
This protect level restricts movement to the initial setting, communicationssetting, and advanced function setting levels.
Setting Change Protect:
Protects changes to setups by operating the front panel keys.
PF Key Protect
Display Changed Parameters
Parameter Mask Enable:
Displayed only when a parameter mask is set.
Password to Move to Protect Level:
Password
Password setting
Note: The time ta ken to move to the protect level can be adjusted by changing the "Move to protect level time" setting.
Note: Displayed only for models with communications. Changes are effective after cycling power or after a software reset.
Protocol Setting:
Switches between CompoWay/F and Modbus.
Communications Unit No.
Communications Baud Rate
CompoWay/F only
Communications Data Length
Communications Stop Bits
Communications Parity
Send Data Wait Time
*1. When the PF Setting parameter is set to A-M.
*2. When the PF Setting parameter is set to PFDP.


Monitor/Setting Item Level
25 0 Monitor/Setting Item Display 1
PF Monitor/Setting Item Display 2
PF Monitor/Setting Item Display 3
PF Monitor/Setting Item Display 4
PF Monitor/Setting Item Display 5
Note: The monitor/setting items to be displayed is set in the Monitor/Setting Item 1 to 5 parameters (advanced function setting level).
Press the Key for at least 1 s.
Advanced Function Setting Level
ALT2 2 Alarm 2 Type
ALH2 0.2 Alarm 2 Hysteresis
ALT3 2 Alarm 3 Type
ALH3 0.2 Alarm 3 Hysteresis
ALT4 2 Alarm 4 Type
ALH4 0.2 Alarm 4 Hysteresis
O1ST 4-20 Control Output 1 Signal Type
O2ST 4-20 Control Output 2 Signal Type
TRST 4-20 Transfer Output Signal Type
TR-T OFF Transfer Output Type
Linear output
TR-H 100.0 Transfer Output Upper Limit
TR-L 0.0 Transfer Output Lower Limit
EV-1 MSPO Event Input Assignment 1
EV-2 StoP Event Input Assignment 2
EV-3 NONE Event Input Assignment 3
EV-4 NONE Event Input Assignment 4
EV-5 NONE Event Input Assignment 5 (E5EC only)
EV-6 NONE Event Input Assignment 6 (E5EC only)
SQR OFF Extraction of Square Root Enable
AMOV 0 Move to Advanced Function Setting Level: Displayed when initial setting/ communications protect is set to 0.
Move by setting password (−169).
INIT OFF Parameter Initialization
MSPU OFF Number of Multi-SP Points
SPRU M SP Ramp Time Unit
RESE R Standby Sequence Reset
S1IN N-O Auxiliary Output 1 Open in Alarm
S2IN N-O Auxiliary Output 2 Open in Alarm
S3IN N-O Auxiliary Output 3 Open in Alarm
S4IN N-O Auxiliary Output 4 Open in Alarm
HBU ON HB ON/OFF
HBL OFF Heater Burnout Latch
HBH 0.1 Heater Burnout Hysteresis
ST-B 15.0 ST Stable Range
ALFA 0.65 α
TCDU 1 Integral/Derivative Time Unit
AT-G 0.8 AT Calculated Gain
AT-H 0.8 AT Hysteresis
LCMA 20.0 Limit Cycle MV Amplitude
INF 0.0 Input Digital Filter
MAV OFF Moving Average Count
O-DP OFF MV Display
RET OFF Automatic Display Return Time
BRGT 3 Display Brightness
A1LT OFF Alarm 1 Latch
A2LT OFF Alarm 2 Latch
A3LT OFF Alarm 3 Latch
A4LT OFF Alarm 4 Latch
PRLT 3 Move to Protect Level Time
CJC ON Cold Junction Compensation Method
A1ON 0 Alarm 1 ON Delay
A2ON 0 Alarm 2 ON Delay
A3ON 0 Alarm 3 ON Delay
A4ON 0 Alarm 4 ON Delay
A1OF 0 Alarm 1 OFF Delay
A2OF 0 Alarm 2 OFF Delay
A3OF 0 Alarm 3 OFF Delay
A4OF 0 Alarm 4 OFF Delay
MVSE OFF MV at Stop and Error Addition
AMAD OFF Auto/Manual Select Addition
MANT Hold Manual Output Method
MANI 0.0 Manual MV Initial Value
RT OFF RT
HSU ON HS Alarm Use
HSL OFF HS Alarm Latch
HSH 0.1 HS Alarm Hysteresis
LBA 0 LBA Detection Time
LBAL 0.0 LBA Level
LBAB 3.0 LBA Band
OUT1 O Control Output 1 Assignment
OUT2 NONE Control Output 2 Assignment
SUB1 ALM1 Auxiliary Output 1 Assignment
SUB2 ALM2 Auxiliary Output 2 Assignment
SUB3 ALM3 Auxiliary Output 2 Assignment
SUB4 ALM4 Auxiliary Output 4 Assignment (E5EC only)
ALMA 49 Integrated Alarm Assignment
T-U M Soak Time Unit
ALSP SP-M Alarm SP Selection
RS-T 4-20 Remote SP Input Type
RSPU OFF Remote SP Enable
RSPH 1300 Remote SP Upper limit
RSPL -200 Remote SP Lower limit
SPTR OFF SP Tracking
MANL OFF Manual MV Limit Enable
PVRP 20 PV Rate of Change Calculation Period
HCTM OFF Heating/Cooling Tuning Method
OMPW 1.0 Minimum Output ON/OFF Band
PF SHFT PF Setting
PFD1 1 Monitor/Setting Item 1
PFD2 0 Monitor/Setting Item 2
PFD3 0 Monitor/Setting Item 3
PFD4 0 Monitor/Setting Item 4
PFD5 0 Monitor/Setting Item 5
SPD1 4 "PV/SP (1)" Display Screen Selection
SPD2 0 "PV/SP (2)" Display Screen Selection
ODSL O MV Display Selection
PVDP ON PV Decimal Point Display
PVST OFF PV Status Display Function
SVST OFF SV Status Display Function
d.REF 0.25 Display Refresh Period
CMOV 0 Move to Calibration Level

Safety Precautions

Refer to Safety Precautions for All Digital Temperature Controllers.

⚠ CAUTION

Do not touch the terminals while power is being supplied.
Doing so may occasionally result in minor injury due to electric shock.

Electric shock may occur. Do not touch any cables or connectors with wet hands.

Electric shock, fire, or malfunction may occasionally occur. Do not allow metal objects, conductors, cuttings from installation work, or moisture to enter the Digital Temperature Controller or the Setup Tool port or ports. Attach the cover to the front-panel Setup Tool port whenever you are not using it to prevent foreign objects from entering the port.

Do not use the Digital Temperature Controller where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.

Not doing so may occasionally result in fire. Do not allow dirt or other foreign objects to enter the Setup Tool port or ports, or between the pins on the connectors on the Setup Tool cable.

Minor electric shock or fire may occasionally occur. Do not use any cables that are damaged.

Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.

CAUTION - Risk of Fire and Electric Shock

a. This product is UL recognised as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
b. More than one disconnect switch may be required to de-energize the equipment before servicing the product.
c. Signal inputs are SELV, limited energy. *1
d. Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. *2

If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.

Tighten the terminal screws to the rated torque of between 0.43 and 0.58 N•m.
Loose screws may occasionally result in fire.

Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents.

A malfunction in the product may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage.
To maintain safety in the event of malfunction of the product, take appropriate safety measures, such as installing a monitoring device on a separate line.

*1. An SELV circuit is one separated from the power supply withdouble insulation or reinforced insulation, that does not exceed 30 V r.m.s. and 42.4 V peak or 60 VDC.
*2. A class 2 power supply is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.

Precautions for Safe Use

Be sure to observe the following precautions to prevent malfunction or adverse affects on the performance or functionality of the product. Not doing so may occasionally result in faulty operation.

1. This product is specifically designed for indoor use only.
   Do not use this product in the following places:
   - Places directly subject to heat radiated from heating equipment.
   - Places subject to splashing liquid or oil atmosphere.
   - Places subject to direct sunlight.
   - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
   - Places subject to intense temperature change.
   - Places subject to icing and condensation.
   - Places subject to vibration and large shocks.
2. Use and store the product within the rated ambient temperatureand humidity.
   Gang-mounting two or more Digital Temperature Controllers, or mounting Digital Temperature Controllers above each other may cause heat to build up inside the Digital Temperature Controllers, which will shorten their service life. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Temperature Controllers.
3. To allow heat to escape, do not block the area around the Digital Temperature Controller.
   Do not block the ventilation holes on the Digital Temperature Controller.
4. Be sure to wire properly with correct polarity of terminals.
5. Use the specified size of crimp terminals for wiring (M3, width of 5.8 mm or less). For open-wired connections, use stranded or solid copper wires with a gauge of AWG24 to AWG18 (equal to a crosssectional area of 0.205 to 0.823 mm^2). (The stripping length is 6 to 8 mm.) Up to two wires of the same size and type or two crimp terminals can be connected to one terminal. Do not connect more than two wires or more than two crimp terminals to the same terminal.
6. Do not wire the terminals that are not used.
7. Use a commercial power supply for the power supply voltage input to a Digital Temperature Controller with AC input specifications. Do not use the output from an inverter as the power supply. Depending on the output characteristics of the inverter, temperature increases in the Digital Temperature Controller may cause smoke or fire damage even if the inverter has a specified output frequency of 50/60 Hz.
8. To avoid inductive noise, keep the wiring for the product's terminal block away from power cables carry high voltages or large currents. Also, do not wire power lines together with or parallel to product wiring. Using shielded cables and using separate conduits or ducts is recommended.
   Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils, or other equipment that have an inductance component).
   When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the product.
   Allow as much space as possible between the product and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.
9. Use this product within the rated load and power supply.
10. Make sure that the rated voltage is attained within two seconds of turning ON the power using a switch or relay contact. If the voltage is applied gradually, the power may not be reset or output malfunctions may occur.
11. Make sure that the Digital Temperature Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.
12. When executing self-tuning, turn ON power to the load (e.g., heater) at the same time as or before supplying power to the product. If power is turned ON to the product before turning ON power to the load, self-tuning will not be performed properly and optimum control will not be achieved.
13. A switch or circuit breaker must be provided close to the product. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
14. Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
15. Design the system (e.g., control panel) considering the 2 seconds of delay that the product's output to be set after power ON.
16. The output may turn OFF when you move to the initial setting level. Take this into consideration when performing control operations.
17. The number of non-volatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data during communications or other operations.
18. Use suitable tools when taking the Digital Temperature Temperature Controller apart for disposal. Sharp parts inside the Digital Temperature Controller may cause injury.
19. Do not connect cables to both the front-panel Setup Tool port and the top-panel Setup Tool port at the same time. The Digital Controller may be damaged or may malfunction.
20. Do not place heavy object on the Conversion Cable, bend the cable past its natural bending radius, or pull on the cable with undue force.
21. Do not disconnect the Communications Conversion Cable or the USB-Serial Conversion Cable while communications are in progress. Damage or malfunction may occur.
22. Do not touch the external power supply terminals or other metal parts on the Digital Temperature Controller.
23. Do not exceed the communications distance that is given in the specifications. Use the specified communications cable.
    Refer to the E5CC/E5EC Digital Controllers User's Manual (Cat. No. H174) for information on the communications distances and cables.
24. Do not bend the communications cables past their natural bending radius. Do not pull on the communications cables.
25. Do not turn the power supply to the Digital Temperature Controller ON or OFF while the USB-Serial Conversion Cable is connected. The Digital Temperature Controller may malfunction.
26. Make sure that the indicators on the USB-Serial Conversion Cable are operating properly. Depending on the application conditions, deterioration in the connectors and cable may be accelerated, and normal communications may become impossible. Perform periodic inspection and replacement.
27. Connectors may be damaged if they are inserted with excessive force. When connecting a connector, always may sure that it is oriented correctly. Do not force the connector if it does not connect smoothly.
28. Noise may enter on the USB-Serial Conversion Cable, possibly causing equipment malfunctions. Do not leave the USB-Serial Conversion Cable connected constantly to the equipment.

Precautions for Correct Use

●Service Life

1. Use the product within the following temperature and humidity ranges:
   Temperature: -10 to 55°C (with no icing or condensation)
   Humidity: 25% to 85%
   If the product is installed inside a control board, the ambient temperature must be kept to under 55°C, including the temperature around the product.
2. The service life of electronic devices like Digital Temperature Controllers is determined not only by the number of times the relay is switched but also by the service life of internal electronic components.
   Component service life is affected by the ambient temperature: the higher the temperature, the shorter the service life and, the lower the temperature, the longer the service life. Therefore, the service life can be extended by lowering the temperature of the Digital Temperature Controller.
3. When two or more Digital Temperature Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to heat radiated by the Digital Temperature Controllers and the service life will decrease. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Temperature Controllers. When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors.

●Measurement Accuracy

1. When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types.
2. When extending or connecting the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance and keep the resistance of the three lead wires the same.
3. Mount the product so that it is horizontally level.
4. If the measurement accuracy is low, check to see if input shift has been set correctly.

●Waterproofing

The degree of protection is as shown below. Sections without any specification on their degree of protection or those with IP□0 are not waterproof.

Front panel: IP66, Rear case: IP20, Terminal section: IP00

●Operating Precautions

1. It takes approximately two seconds for the outputs to turn ON from after the power supply is turned ON. Due consideration must be given to this time when incorporating Digital Temperature Controllers in a sequence circuit.
2. Make sure that the Digital Temperature Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.
3. When using self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Temperature Controller. If power is turned ON for the Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.
4. When starting operation after the Digital Temperature Controller has warmed up, turn OFF the power and then turn it ON again at the same time as turning ON power for the load. (Instead of turning the Digital Temperature Controller OFF and ON again, switching from STOP mode to RUN mode can also be used.)
5. Avoid using the Controller in places near a radio, television set, or wireless installing. These devices can cause radio disturbances which adversely affect the performance of the Controller.

●Others

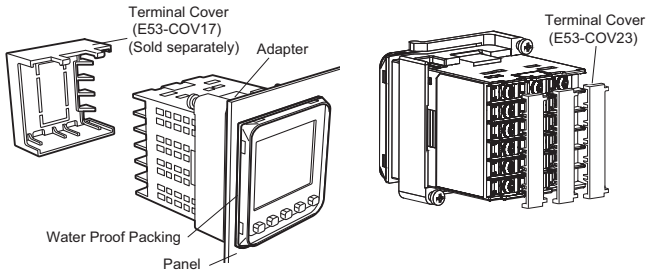
1. Do not connect or disconnect the Conversion Cable connector repeatedly over a short period of time.
   The computer may malfunction.
2. After connecting the Conversion Cable to the computer, check the COM port number before starting communications. The computer requires time to recognize the cable connection. This delay does not indicate failure.
3. Do not connect the Conversion Cable through a USB hub. Doing so may damage the Conversion Cable.
4. Do not use an extension cable to extend the Conversion Cable length when connecting to the computer. Doing so may damage the Conversion Cable.

●Mounting

Mounting to a Panel

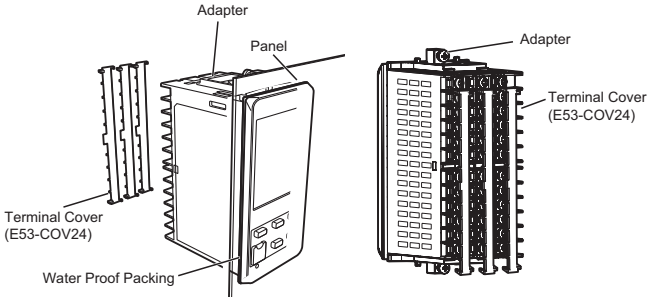
E5CC

There are two models of Terminal Covers that you can use with the E5CC.



1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.
2. Insert the E5CC into the mounting hole in the panel.
3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5CC.
4. Tighten the two fastening screws on the adapter.
   Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N•m.

E5EC



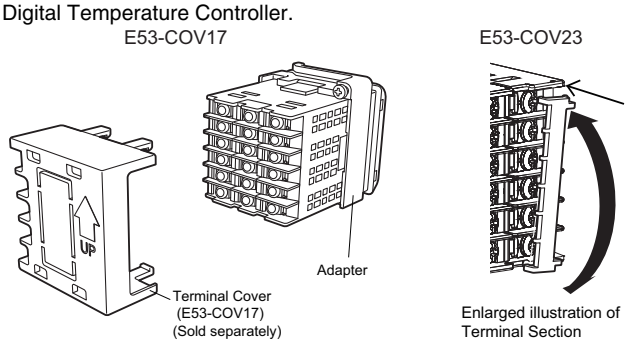
1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.
2. Insert the E5EC into the mounting hole in the panel.
3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5EC.
4. Tighten the two fastening screws on the adapter. Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N•m.

Mounting the Terminal Cover

E5CC

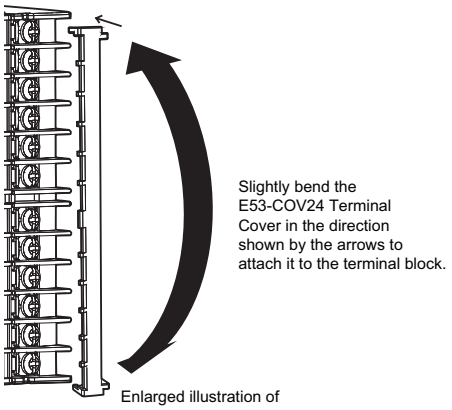
Slightly bend the E53-COV23 Terminal Cover to attach it to the terminal block as shown in the following diagram. The Terminal Cover cannot be attached in the opposite direction. E53-COV17 Terminal Cover can be also attached.

Make sure that the "UP" mark is facing up, and then attach the E53-COV17 Terminal Cover to the holes on the top and bottom of the Digital Temperature Controller.



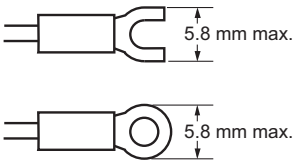
E5EC

Slightly bend the E53-COV24 Terminal Cover to attach it to the terminal block as shown in the following diagram. The Terminal Cover cannot be attached in the opposite direction.



●Precautions when Wiring

- Separate input leads and power lines in order to prevent external noise.
- Use a shielded, AWG24 to AWG18 (cross-sectional area of 0.205 to 0.8231 mm^2) twisted-pair cable.
- Use crimp terminals when wiring the terminals.
- Use the suitable wiring material and crimp tools for crimp terminals.
- Tighten the terminal screws to a torque of 0.43 to 0.58 N•m.
- Use the following types of crimp terminals for M3 screws.



Three-year Guarantee

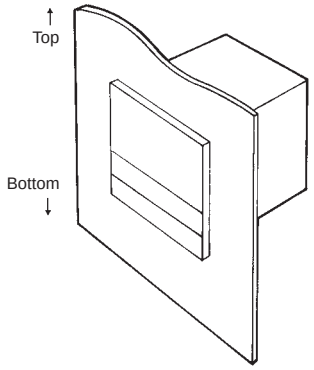
●Period of Guarantee

The guarantee period of the Unit is three years starting from the date the Unit is shipped from the factory.

Scope of Guarantee

The Unit is guaranteed under the following operating conditions.

1. Average Operating Temperature (see note): −10°C to 50°C
2. Mounting Method: Standard mounting



Note: Average Operating Temperature
Refer to the process temperature of the Unit mounted to a control panel and connected to peripheral devices on condition that the Unit is in stable operation, sensor input type K is selected for the Unit, the positive and negative thermocouple input terminals of the Unit are short-circuited, and the ambient temperature is stable.

Should the Unit malfunction during the guarantee period, OMRON shall repair the Unit or replace any parts of the Unit at the expense of OMRON.

Read and Understand this Catalog

Please read and understand this catalog before purchasing the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

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In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the product in the customer's application or use of the product.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

Note: Do not use this document to operate the Unit.

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